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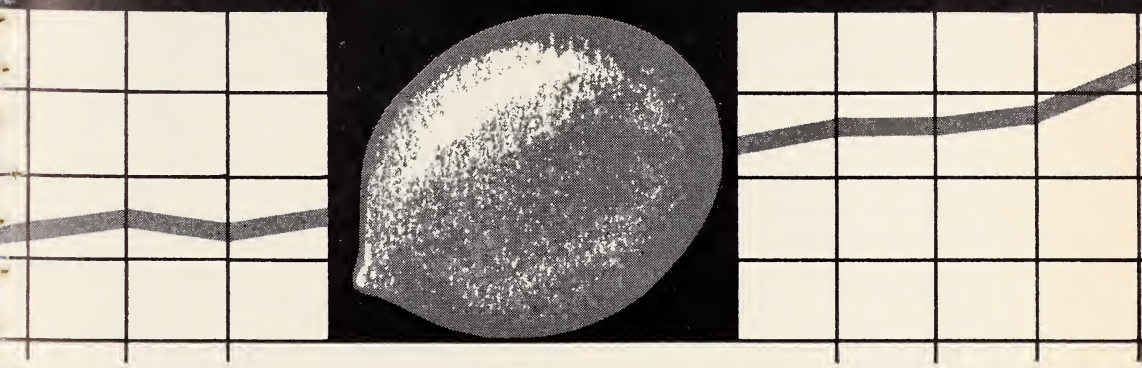
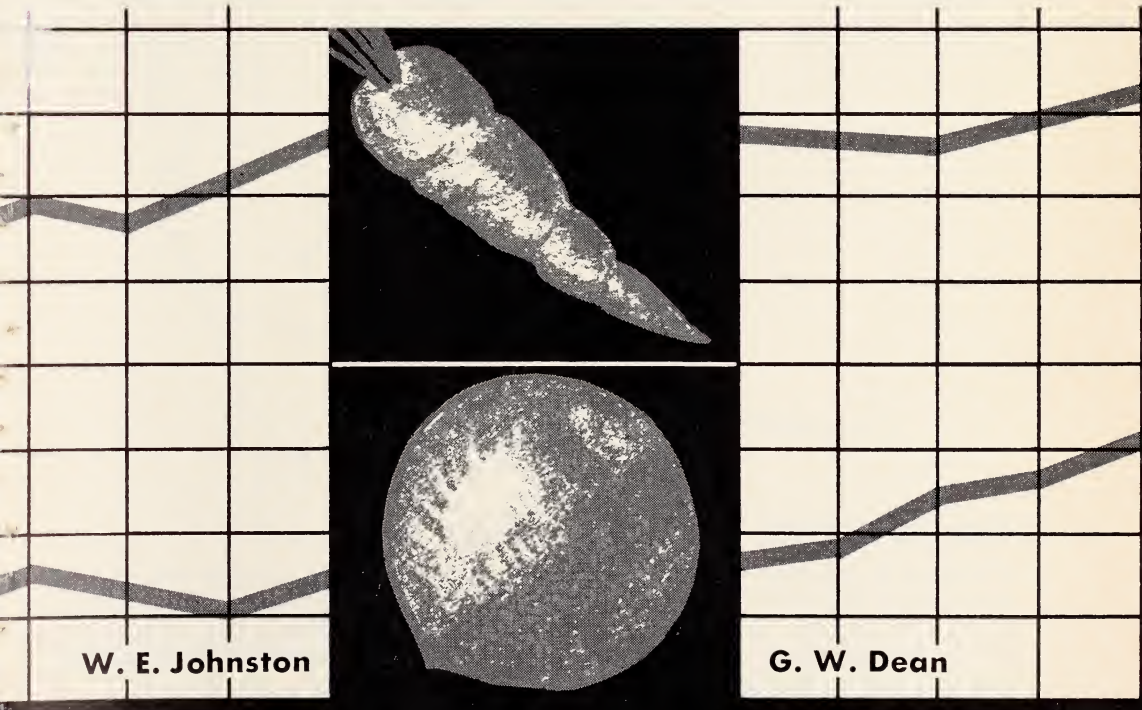


CALIFORNIA CROP TRENDS: YIELDS, ACREAGES, AND PRODUCTION AREAS



W. E. Johnston

G. W. Dean

CALIFORNIA AGRICULTURAL
Experiment Station
Extension Service

CIRCULAR 551

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This circular updates and expands Circular 488, by G. W. Dean and C. O. McCorkle, Jr.

California Crop Trends: Yields, Acreages, and Production Areas

1 North Coast
2 North Central
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5 Sacramento Valley
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THESE ARE THE CROP-REPORTING DISTRICTS

INTRODUCTION

Information often requested is here brought together and summarized to show trends in the yields, acreages, and production areas of 42 major California crops. The graphs show *what* the trends have been; the text tells *why,* and summarizes major factors behind the changes.

The report serves two purposes: it records longtime trends and short-run changes, and it aids in understanding future cropping possibilities. No attempt is made to forecast trends, except for some very short-run changes. Projection of future crop patterns must await a more detailed study, for experience has shown that simple extension of trends is misleading.

California produces too many crops for all of them to be covered here, so this report is restricted to selected crops grossing more than eight million dollars each in the mid-1960's. Completeness of coverage varies—from nearly all of the citrus fruits and tree nuts, through 98 per cent of deciduous fruits and 93 per cent of vegetable crops, to only 89 per cent of field crops.

The figures are exact for crops regulated by government programs (sugar beets, cotton, etc.) or by industry-wide programs (cling peaches, lemons, etc.); fairly exact for crops grown in quite restricted areas (mostly vegetables) and for crops that are slow in reaching production (tree crops); and least exact for crops grown throughout the state and subject to sizable year-to-year changes (barley, alfalfa, and several other field crops). The last group is extremely difficult to estimate with precision, and government agencies lack the resources to

VALUE OF PRODUCTION (SELECTED COMMODITIES), CALIFORNIA, 1968

Commodity	Value in thousands of dollars
Tree fruits and nuts	
Deciduous fruits	
Apples	27,480
Apricots	24,940
Cherries	11,650
Grapes	192,984
Peaches, Clingstone	69,916
Peaches, Freestone	24,050
Pears	45,804
Plums	18,720
Prunes	43,680
Citrus fruits	
Grapefruit	12,230
Lemons	49,476
Oranges, Navel	39,345
Oranges, Valencia	42,400
Tree nuts	
Almonds	41,904
Walnuts	48,160
Semitropical fruits	
Avocados	17,204
Olives	31,992
Total tree fruits and nuts	741,935

VALUE OF PRODUCTION (SELECTED COMMODITIES), CALIFORNIA, 1968

Vegetable crops	
Asparagus	28,627
Beans, green lima	12,197
Broccoli	22,701
Brussels sprouts	7,966
Cantaloupes	49,544
Carrots	38,915
Cauliflower	17,285
Celery	40,704
Lettuce	120,019
Onions	22,522
Potatoes	82,529
Strawberries	60,741
Tomatoes, fresh	72,208
Tomatoes, processing	203,433
Total vegetable crops	779,391
Field crops	
Alfalfa hay	167,726
Alfalfa seed	19,796
Barley	75,221
Beans, dry	37,166
Corn	23,726
Cotton	214,931
Rice	113,141
Safflower	14,678
Sorghum grain	30,240
Sugar beets	85,357
Wheat	15,959
Total field crops	797,941

Source: California Crop and Livestock Reporting Service.

take a complete census of each crop. The sampling methods devised as the only practical alternative are subject to some error.

Because the figures on year-to-year changes cannot be considered precise, the discussion generally follows longer trends. However, certain year-to-year changes are quite pronounced and are clearly explainable by unusual weather, acreage controls, or widespread incidence of pests or disease.

The periods for which figures are available vary with the crop and with counties or crop-reporting districts. Fruit and nut crops, which require relatively long periods for accurate depiction of trends, fortunately have figures extending back to 1920. Annual crops are shown for shorter periods (vegetables from 1933, and some field crops only from 1938).

To indicate broad shifts in producing areas and to compare the importance of areas, trends are shown for principal districts. However, the method of division (by crop-reporting districts) is not completely satisfactory—it presents a broad picture, but the reader must remember (1) that the districts follow county lines rather than climatic or economic boundaries; (2) that production of certain crops is extremely localized, even within a district or a county or a portion thereof; and (3) that crops may shift within a crop-reporting district. However, such shifts are pointed out in the text.

The graphs omit districts 1, 2, 3, and 6, which are minor crop-producing areas in California. An occasional important crop in those areas is discussed in the text.

APPLES

General description of the industry

Apple production in the United States is concentrated in three main areas: The Pacific region (Washington and California), the East (New York, Pennsylvania, and Virginia), and the North Central region (mainly Michigan). California produces about 8 per cent of the U.S. crop and ranks fourth in production behind (in order) Washington, New York, and Michigan. In the last 30 years the processed proportion of the U.S. crop has increased from about 22 per cent to 37 per cent. The processing market appears to act as a buffer to wide changes in prices from year to year; processors tend to buy heavily in surplus years and lightly in small-crop years, which results in a fairly stable annual volume moving into the fresh-fruit market.

Producing regions differ markedly in the proportion of production processed. The eastern states are predominant in processing, with about 45 per cent of their production going into this market. The state of Washington, however, is predominantly a fresh-apple producer with only about 15 per cent of its production processed. Among the major apple-producing states, California has the highest proportion of its production used in processing—up to 70 per cent of total production in recent years. All forms of processed products are important outlets for California apples—canned (applesauce), dried, juice, and frozen uses. The principal California varieties are Gravenstein, Red Delicious, Golden Delicious, Newtown, and Rome Beauty.

Changes in acreage and location of production

The bearing acreage of apples in California, which declined steadily after about 1925, has stabilized in the past 10 years at about 20,000 acres. Increases in new plantings in the Central Coast district in the late 1950's have been primarily responsible for the leveling off in bearing acreage recently, as shown by the increase in nonbearing acreage.

Apples require a long, cool growing season permitting slow development of the crop. High summer temperatures cause sunburn and some damage to the fruit. Thus, apple production in the interior valleys and southern California is found only at higher elevations having moderate summer temperatures and sufficient winter chilling. These growing requirements have centered the apple industry in the Sebastopol area of Sonoma County and the Watsonville area of Santa Cruz County, where about 80 per cent of California apples are produced. Commercial acreage is also found in the foothills of several counties from Butte south through Kern, and also at higher elevations in southern California, though the effects of moderate winters on yields have reduced acreage in these southern counties over time.

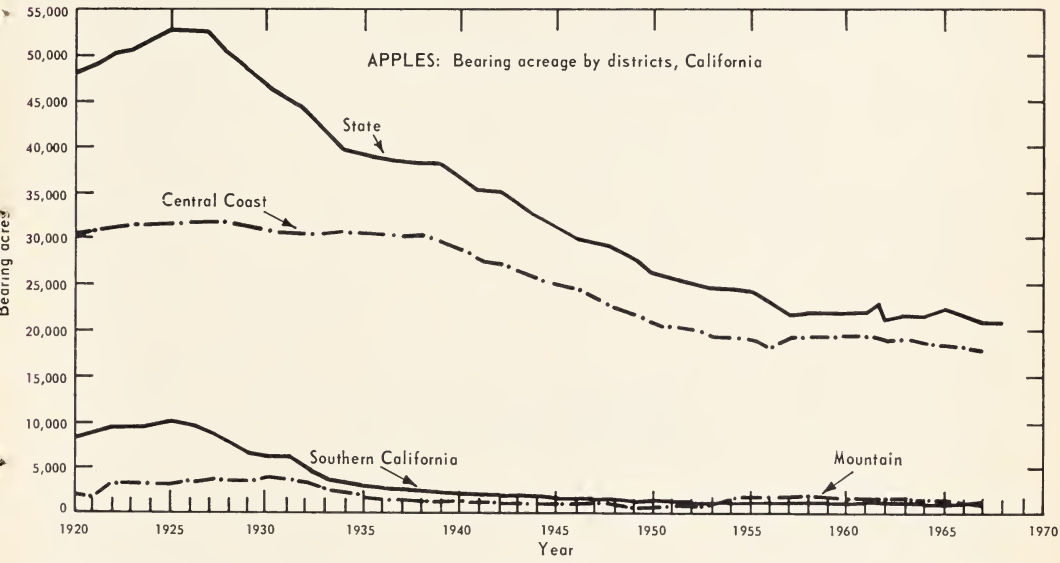
Recent plantings of new acreage have been primarily in the Watsonville area of Santa Cruz County. Red Delicious and Red Delicious Sport varieties have been favored because of higher yields per acre.

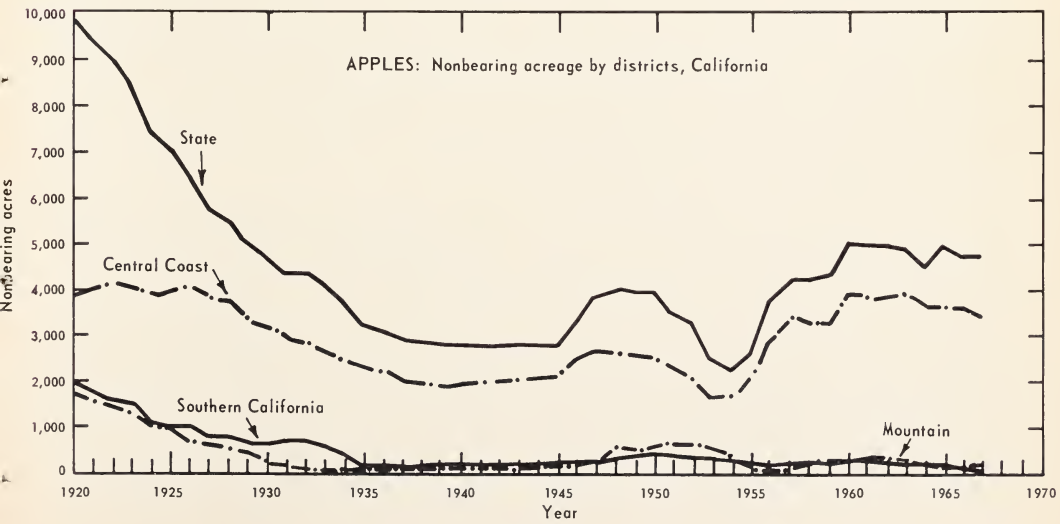
Trends in yields and production

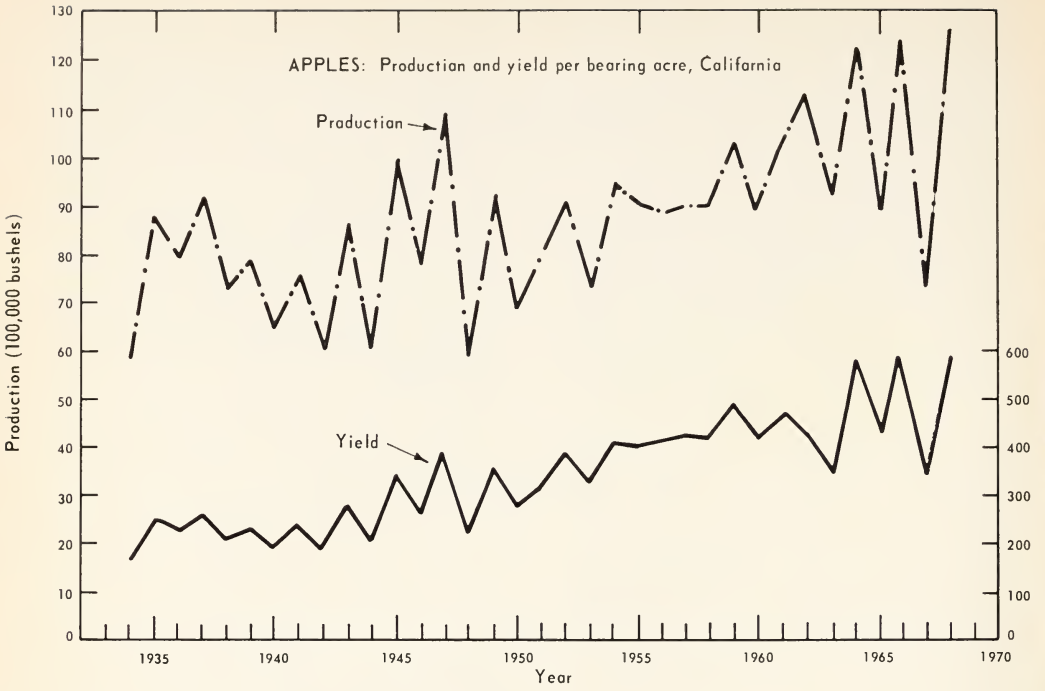
Yields per bearing acre have generally increased since 1950, with average yields in the early 1960's over twice those of the 1930's. While the long-term trend in yields is definitely upward, yields have fluctuated sharply from year to year due to the tendency of apple trees to bear heavily in alternate years. Exceptionally low yields in 1967 were due to heavy rains during the blooming period, resulting in a light set and in scab damage, particularly on Gravensteins. Yields have tended to in-

crease primarily because marginal orchards and low yielding varieties have been pulled and replaced with higher yielding varieties. Apple production has also become more specialized, with consequent use of more exacting cultural practices such as complete spray programs.

Until the past 10 years, the increase in yield per acre in California was approximately offset by a decline in bearing acreage, so that total production fluctuated around an average of 8,000,000 bushels. However, the leveling off in bearing acreage, together with increased yields, has resulted in generally rising total production in the past 10 years. Recent heavy plantings in the other major apple-producing states, particularly in Washington, indicate that U.S. apple production is likely to increase sharply over the next few years. Fresh market outlets do not appear sufficient to absorb all of the projected increase in fresh production at favorable prices. Thus, the processed outlet is likely to feel the pressure of increased supplies as a larger percentage of the production of fresh varieties is diverted to the processed market.







APRICOTS

General description of the industry

California produces over 90 per cent of the total U.S. apricot production. Utah and Washington are the other major producing states, and minor quantities are grown in Oregon, Montana, and Colorado. Prior to World War II, over two-thirds of California production was sold as dried apricots, but in the postwar period the percentage devoted to other forms of processing has sharply increased, with about 70 per cent of the crop canned and 4 per cent frozen in recent years. Around 20 per cent of the crop is still dried, with only 6 to 7 per cent sold fresh. The shift from drying to canning and freezing has been attributed to shifts in consumer demand, the high labor cost of drying, loss of dried export markets, and more strict sanitary and quality regulations of dried fruit.

Fresh production in California is concentrated in climatic areas favoring early maturity. Fresh apricots from the Winters district reach eastern markets in early June, and Brentwood production follows in late June and early July. Out-of-state production is primarily fresh but reaches eastern markets late enough not to compete directly with California's fresh shipments.

Changes in acreage and location of production

In the early and mid-1920's heavy planting of new trees was encouraged by high grower returns for dried fruits in export markets, and during this expansion apricots were planted in some areas not well adapted to them. Bearing acreage has declined markedly since the late 1920's—low returns to growers during the depression

years contributed to the steady decline in bearing and nonbearing acreage. The rate of decline increased as a result of reduced plantings during the war years and extensive pulling of older trees. However, the increase in new plantings since 1955 has about offset pullings, resulting in an acreage stabilizing at about 37,000 bearing acres.

The Central Coast district (specifically the Santa Clara Valley south to the Hollister district) has been predominant in apricot acreage for 30 years because of its climate. The apricot, an early bloomer, is subject to severe damage where spring frosts are common and is subject to quality loss where summer temperatures are high. Cold location or areas with frequent spring and summer fog are also unsuitable. Areas near San Francisco Bay, particularly the sheltered valleys in Santa Clara, Contra Costa, Solano, San Benito, and Monterey counties, have thus been commonly selected. Acreage in the Central Coast areas has declined because of housing subdivisions in Santa Clara County and (in some lobalities) increased interest in vegetable production.

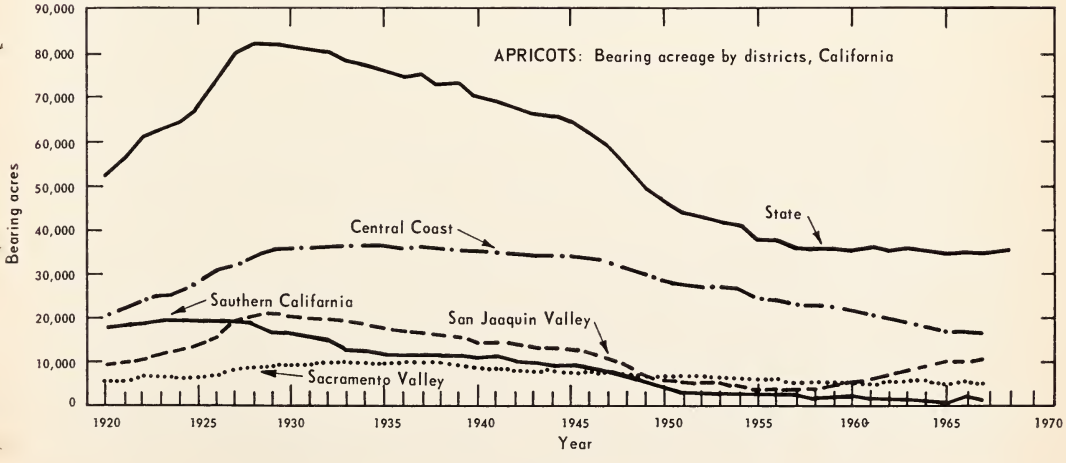
The San Joaquin Valley area rose to major importance in the early 1930's and then declined steadily until the late 1950's. Lack of knowledge concerning the limited adaptability of apricots was probably responsible for this early expansion in marginal areas and subsequent decline. Recently, however, there have been significant increases in apricot acreage in the better-adapted areas of the west side of the northern San Joaquin Valley, centered in the Modesto-Tracy-Patterson district. Production in this area is largely for processing.

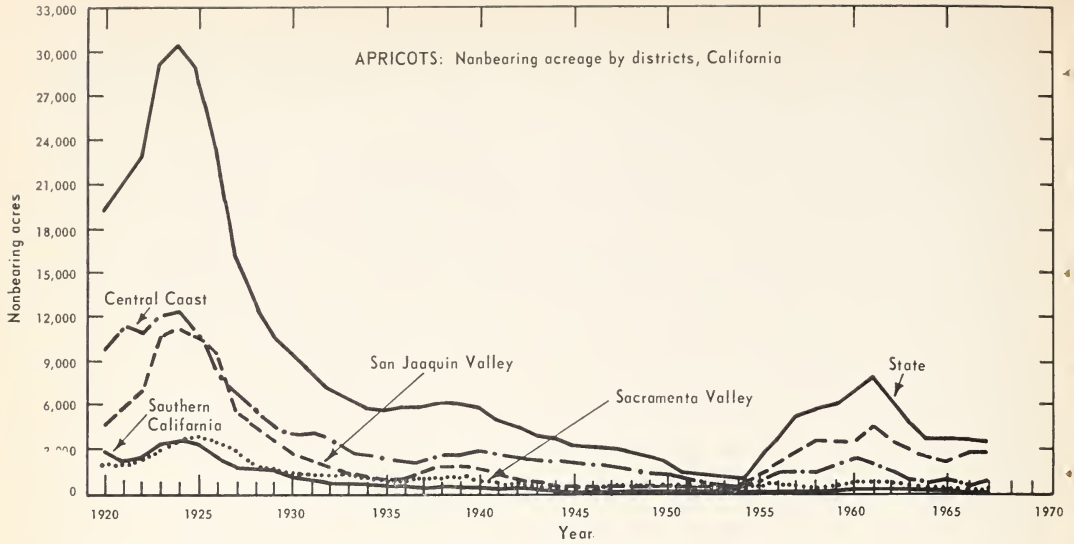
Acreage in the Sacramento Valley (chiefly at Winters and Fairfield) has remained nearly constant for the last 10 years at only slightly less than the peak historical acreage. These areas are the early shipping districts, characterized by relatively warm springs that ripen fruit before the high summer temperatures.

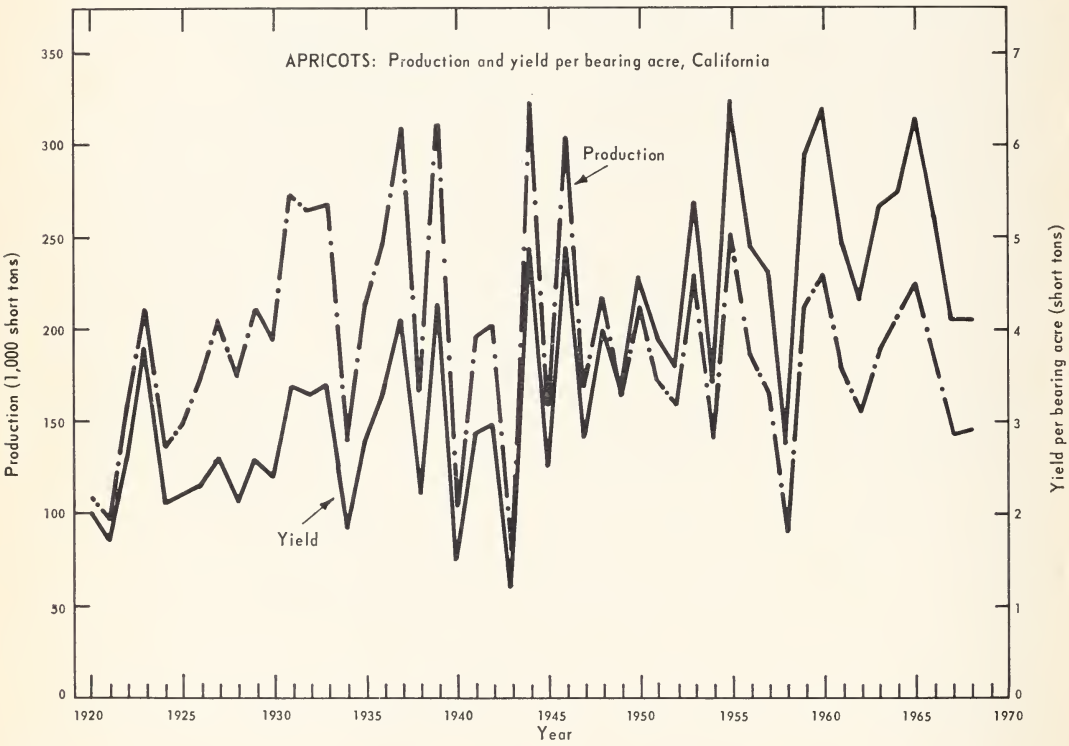
Southern California, an important producer of apricots before 1930, has declined in importance. Principal southern California districts were near Hemet (Riverside County) and in southeastern Ventura County near Moorpark.

Trends in yields and production

Apricot yields vary greatly from year to year. Alternate bearing is partly responsible for this, as is unfavorable weather during blossoming or ripening. For example, in 1967, heavy and prolonged winter and spring rainstorms, cold and frosty nights, hail storms, and wind hampered the bloom. Despite these wide annual fluctuations, yields have increased gradually and more markedly since the early 1940's. The reason is partly that commercial acreage is concentrated in better-adapted areas and that old trees







have been pulled; an additional factor is the accumulated results of many minor improvements in cultural practices. There is a need for development of new processing varieties better adapted to the northern San Joaquin Valley districts.

Total production from year to year strongly reflects the variation in yield. The lack of a definite long-term trend in production indicates that decline in acreage has been approximately offset by increasing yield. However, with new plantings in favorable districts, and with most removals having been in areas where trees are relatively old, an increase in total production is probably forthcoming.

CHERRIES

General description of the industry

California is the nation's leading producer of sweet cherries, having approximately 30 per cent of U.S. production; it is followed closely by Oregon and Washington. Historically, about half of the California crop has been sold fresh and half processed. Composition of the processed portion shifted sharply in the early 1930's from canning to brining, and in recent years approximately one-third of the crop has been utilized in brine form. Some brined cherries are used in candy, ice cream, and bakery products; some are processed further and sold as maraschino cherries. California canners require large quantities of maraschino cherries in their packs of canned fruit cocktail and fruit salad.

The state's fresh cherries mature early and are marketed before supplies of cherries from other states become heavy. Eighty to eight-five per cent of these cherries are shipped by mid-June; other states ship only 10 per cent of their crop by that time. However, processed cherries from California compete directly with those from other states. The two major varieties produced in California are Bing and Royal Ann.

Changes in acreage and location of production

Bearing acreage of cherries in California rose rapidly between 1920 and the peak year of 1938 (almost 15,000 acres), and then declined steadily until 1950 (to about 9,500 acres). In the past 10 years, bearing acreage first stabilized and then increased slightly due to the sharply increased rate of new plantings in the 1950's. Favorable prices and grower returns were largely responsible for the increase in new plantings and, therefore, nonbearing acreage during this period. Decrease in nonbearing acreage since 1962 suggests that the bearing acreage of California cherries will be relatively stable in the near future.

The Santa Clara Valley, in the Central Coast region, and the Lodi-Linden district, in the San Joaquin Valley, are the two centers of California's cherry production. Over 80 per cent of the cherry acreage in the state is accounted for by the two counties involved. Because of the exacting climatic requirements of the cherry tree, substantial cherry acreage is not expected to extend too far from bay weather influence—either farther south in the San Joaquin Valley or north in the Sacramento Valley. Cherries are also sensitive to soil conditions, producing best on light, well-drained loamy soils, further limiting the adapted areas.

Until about 1958, the major cherry district of the state was in the Santa Clara Valley. Rapid industrial and urban growth on favorable sites in this area has resulted in a sharp decline in cherry acreage in the past few years. Although there have been some new plantings in the area, it is likely that the bearing acreage will continue to decline. The sharp drop in acreage in the Santa Clara Valley recently has been offset almost exactly by corresponding increases in the other major cherry area—the Lodi-Linden area of San Joaquin County. Growers moving from the Santa Clara Valley are responsible for much of the expansion there. Southern California and the Sacramento Valley acreages of cherries have declined over time. There is no apparent interest in substantial expansion of plantings in these areas.

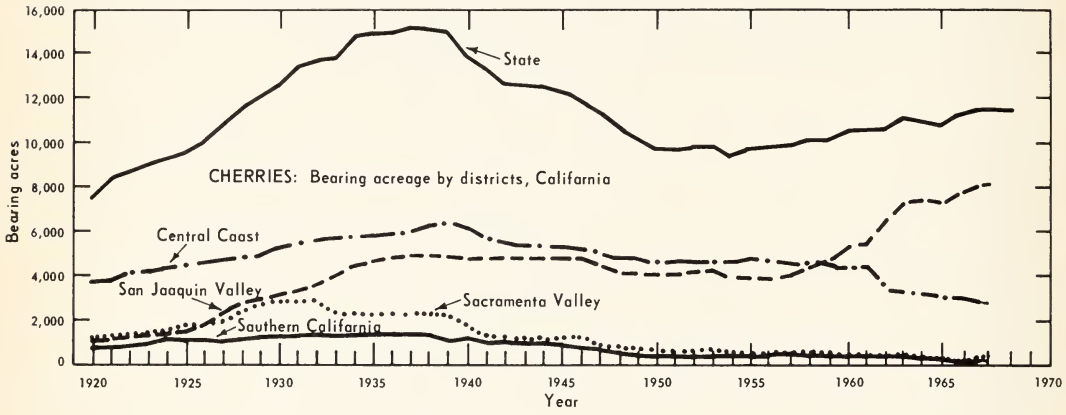
Trends in yields and production

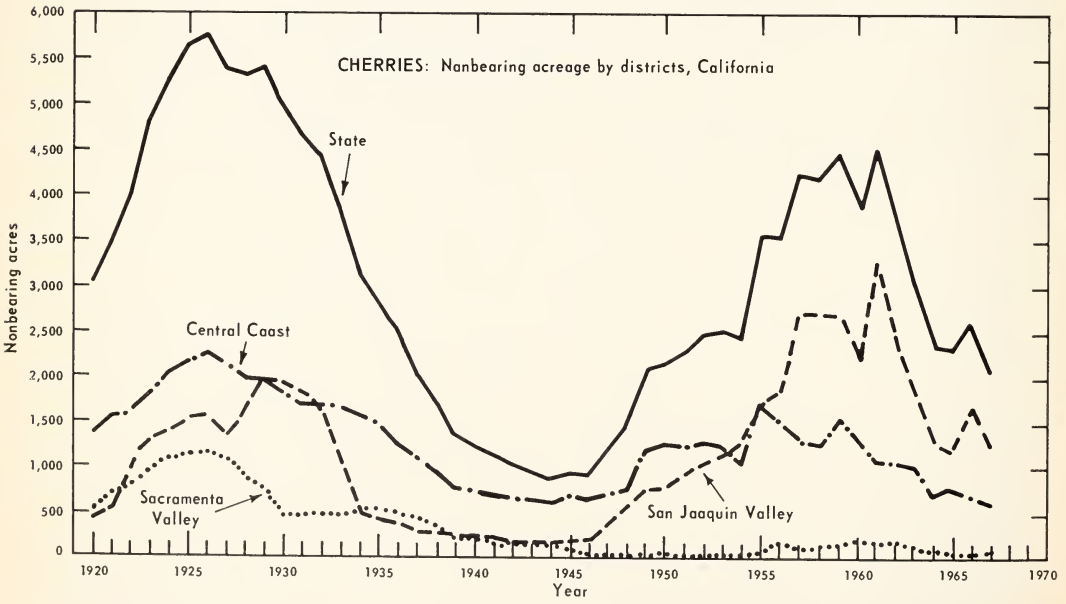
Yields of cherries fluctuate widely from year to year, primarily as a result of variable weather conditions. Being an early fruit, cherries are subject to severe damage from frost at blossom time and from rain during ripening. Yield variation from year to year is accentuated because cherry orchards are not thinned or pruned.

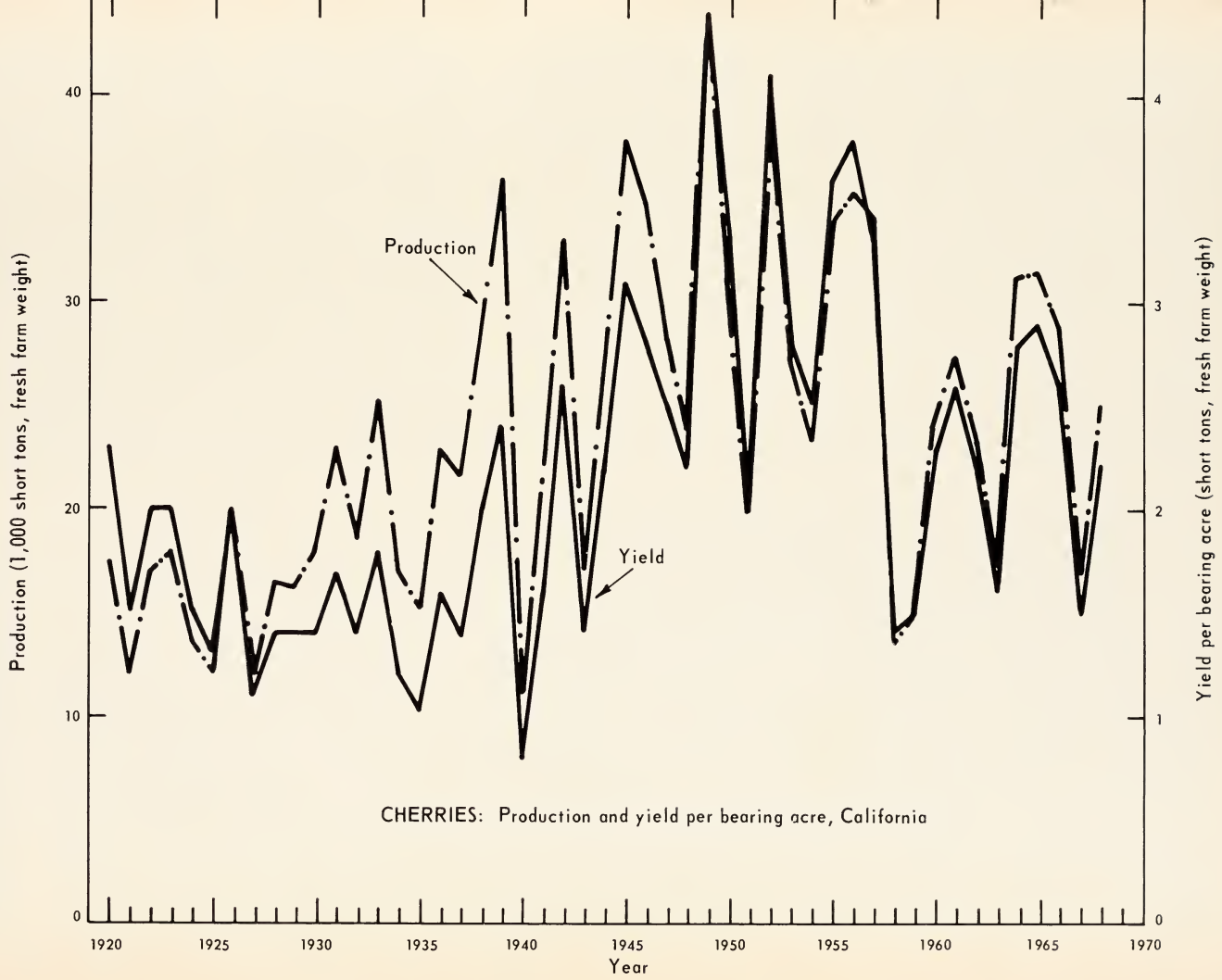
From the mid-1930's through the mid-1950's, the general yield level for cherries increased at a rapid rate. The annual

average yield in 1952–1956 was 3.3 tons compared with 1.7 tons in 1935–1939. Improved disease recognition and control, soil and water management, and care of trees are important factors contributing to this increase. However, in the past 10 years yield levels have declined somewhat, primarily because of a considerably larger proportion of the bearing trees in the state being at less than full maturity. This shift in age composition is due to removal of old trees in the Santa Clara Valley and planting of new trees in San Joaquin County. Future yields should increase as the age composition shifts toward older trees. Further increases should also result from more plantings using virus-free rootstock.

With stabilization of acreage and moderate increases in yields, total production could increase somewhat in the near future. However, the large year-to-year fluctuations prevent accurate forecasting for a given year.







CHERRIES: Production and yield per bearing acre, California

GRAPES

General description of the industry

California produces 90 per cent of the U.S. grape crop. Three general varietal classes are produced—raisin, wine, and table grapes. Some varieties in the raisin and table classes are multipurpose and may go to two or all three outlets, depending on relative supplies and prices. Hence, the several markets are highly interrelated—developments in one segment of the industry are felt almost immediately in the other segments. Raisin varieties comprise the major proportion of California production, having increased in recent years to about two-thirds of the total; the remaining production is about equally divided between table and wine varieties. Thompson Seedless predominates in the raisin variety, but a "three-way grape whose production in recent years has been allocated about 52 per cent to raisins, 10 per cent to fresh use, and 38 per cent to wine. In recent yaers, around 55 per cent of the table varieties have also been diverted to wine. Around 90 per cent of the wine varieties are used for wine. Thus, with increasing industry supplies, about half of the annual grape crop has been crushed for wine and brandy.

In general, wine is a secondary outlet for table and raisin varieties and thus large variations in industry supply tend to be translated rather directly into variations in the wine crush. The wine industry has faced increasing competition from other states and from imports in recent years, and has tried to operate a surplus-control program by diverting some supplies to nonbeverage markets such as industrial alcohol. A large number of industrial, federal, and state programs have been attempting to stabilize prices and returns in the industry over the years.

Changes in acreage and location of production

There are only three or four years between planting and commercial production of grapes, so that changes in bearing acreage lag but briefly behind changes in nonbearing acreage. High prices of fresh grapes from 1919 through 1922, and of raisins from 1919 through 1921, tremendously stimulated California nonbearing grape acreage in the early 1920's. Then excessive supplies and depressed prices reduced new plantings. As a result bearing acreage peaked in the late 1920's, declined until the mid-1930's, and then held relatively stable as new plantings offset vine removals for about a decade. In the mid-1940's, high prices encouraged new plantings, and nonbearing acreage again increased sharply. Prices and nonbearing acreage declined in the late 1940's, followed by a decline in bearing acreage until about 1956.

Depressed prices and burdensome surpluses in the postwar years can be traced partly to loss of the large prewar export market for raisins. Furthermore, domestic per capita consumption of fresh grapes and raisins has declined substantially since World War II. Even though per capita wine consumption in the U.S. has doubled since prewar years, this sector has not taken all the increased supplies at favorable prices.

The long-term decline in bearing grape acreage was halted in 1956 as new plantings increased rapidly in the late 1950's in response to somewhat more favorable prices, diversion of land from cotton because of allotments, and new sources of water in the San Joaquin Valley. Although the rate of new plantings has dropped off since 1960, the bearing acreage continued to climb through 1965.

The San Joaquin Valley is the heart of the state's grape industry, which centers in Fresno County and extends north into Madera County and south into Tulare County and Kern County. Almost the entire California acreage of raisin varieties (mainly Thompson Seedless), a major acreage of table grapes, and many wine grapes are located in this region. The other major production area in the San Joaquin Valley is in San Joaquin, Stanislaus, and Merced counties, where large quantities of wine and table grapes are produced.

Other important areas for high-quality wine grapes are the Central Coast areas of central Sonoma County and the Napa-St. Helena district, and districts near Ontario, in San Bernardino County. Riverside County also produces substantial quantities of raisin and table grapes.

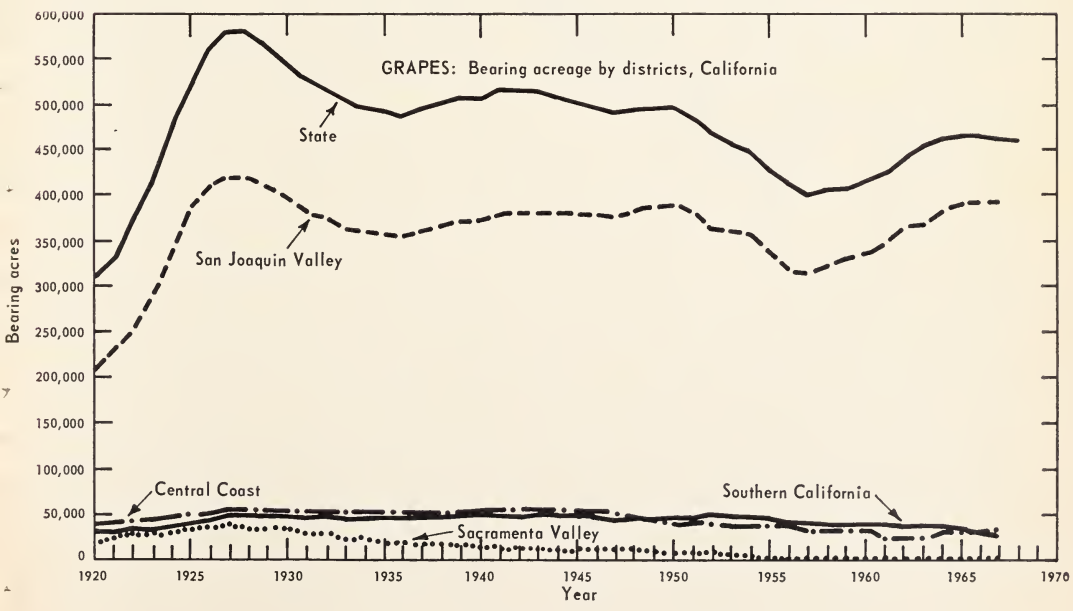
The major fluctuations in both nonbearing and bearing acreages have taken place in the San Joaquin Valley. Total bearing acreage in southern California has remained relatively static, though grape varieties have shifted significantly in the last decade. Large acreages of wine grapes have been pulled, but new acreage of early table varieties in the desert region has offset that decline. The Sacramento Valley (mainly the table and wine grape area of Sacramento County) has almost disappeared from the industry. Bearing acreage in the Central Coast area has declined moderately since the war, mostly in the relatively low-yielding wine grape areas of Sonoma County, especially on steep slopes or vineyards badly weakened by phylloxera. Urbanization in Alameda, Contra Costa, and San Benito counties has also been a factor in reduced acreages on the Central Coast.

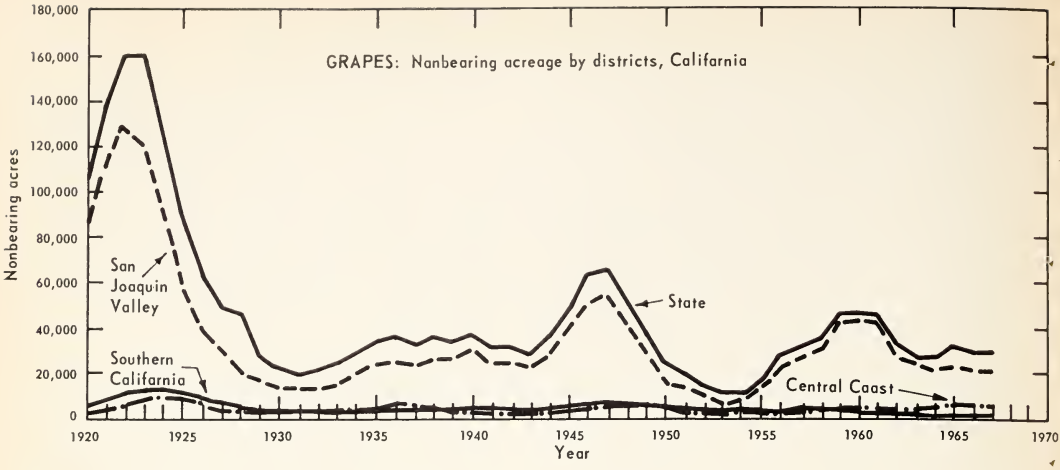
Trends in yields and production

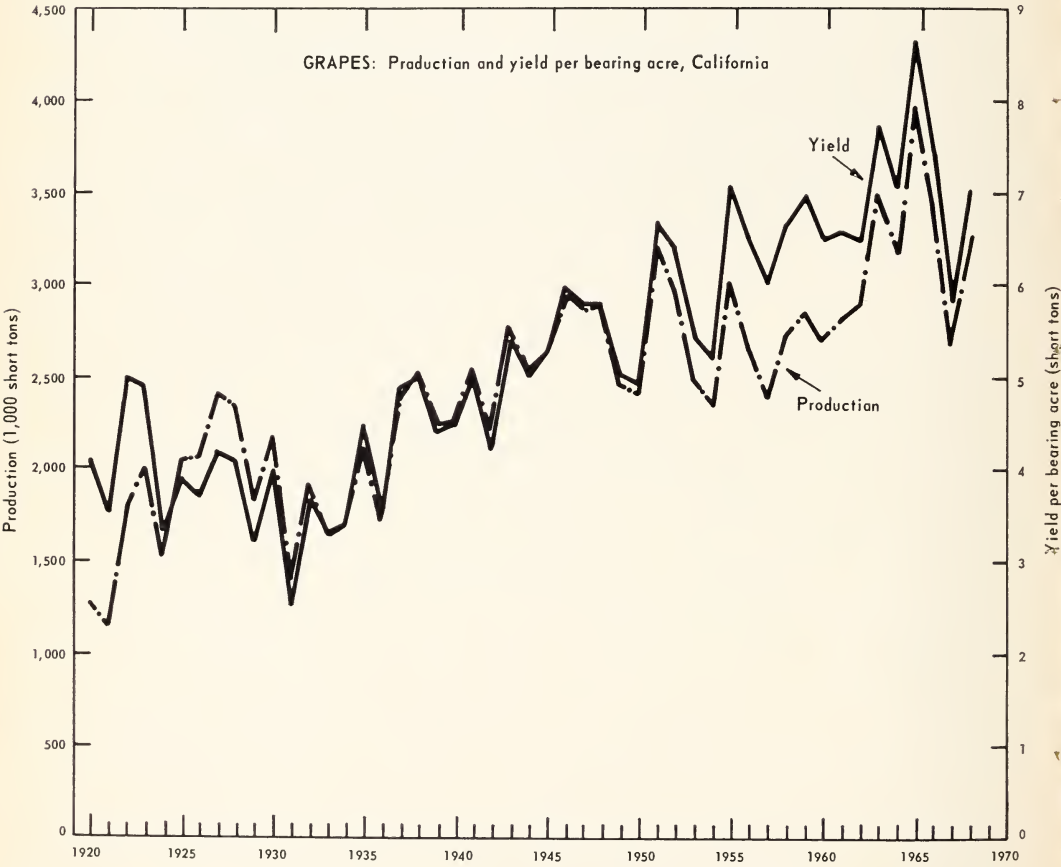
Grape yields have increased substantially since the early 1930's, averaging over 7 tons per acre in the past few years. Increased use of irrigation, better disease control, planting on better soils, removal of marginal plantings, and increased plantings of high-yielding varieties such as Thompson Seedless have all contributed to higher yields.

Total production in the state has generally increased since the 1930's. Until the late 1950's, declines in acreage were more than offset by increases in yields. Since that time, total production has increased more rapidly due to an expansion of acreage along with a continuing uptrend in yields. Grape yields vary widely from year to year due to frost, high temperatures, and rain.

Total bearing acreage in the state has leveled off and should remain fairly stable in the next few years as the rapid rate of new plantings in the late 1950's and early 1960's has declined somewhat. However, total production can probably be expected to increase due to further yield increases.




GRAPES: Nanbearing acreage by districts, Califarnia
Nonbearing acres
180,000
160,000
140,000
120,000
100,000
80,000
60,000
40,000
20,000
0
San Joaquin Valley
Southern Califarnia
State
Central Caast
1920
1925
1930
1935
1940
1945
1950
1955
1960
1965
1970
Year


GRAPES: Praductian and yield per bearing acre, California
Production (1,000 short tons)
4,500
4,000
3,500
3,000
2,500
2,000
1,500
1,000
500
0
Yield per bearing acre (short tons)
9
8
7
6
5
4
3
2
1
0
Yield
Praductian
1920
1925
1930
1935
1940
1945
1950
1955
1960
1965
1970

CLINGSTONE PEACHES

General description of the industry

California is the only important area of commercial clingstone peach production in the United States. Although small portions of the crop were dried, frozen, and consumed fresh during the 1930's and 1940's, recent years have seen essentially the entire crop marketed in canned form. In the post-World War II period, exports of canned peaches have increased markedly. In recent years, about 20 per cent of the canned pack has been sold overseas.

Industry controls of some sort have been used in most years since 1931; from 1936 on, control programs have been under the authority of California legislation. Among other aspects of the marketing order are provisions for volume control through an orchard green-drop program and a cannery set-aside. The green-drop provision has been used to reduce volume marketed by approximately 10 to 15 per cent in a number of years since 1959. Under certain conditions, growers may use trees pulled (tree credits) as a substitute for the green drop.

Changes in acreage and location of production

Heavy plantings of cling peaches in the early 1920's caused a peak in nonbearing acreage in 1924, resulting in rapid expansion of bearing acreage in the late 1920's. Consequent overproduction and low prices in the late 1920's and early 1930's discouraged new plantings, and nonbearing acreage declined to a low of 6,000 acreas in 1934. Nonbearing acreage then increased, with the result that bearing acreage stabilized in the late 1930's and then gradually increased. In the late 1950's, relatively high prices encouraged a sharp increase in new plantings, and a subsequent significant increase in bearing acreage and production. As a result the green-drop provisions of the marketing order have been invoked fairly regularly. In response to economic pressure, the rate of new plantings declined in the early 1960's and bearing acreage appeared to have reached a peak. However, a renewed rate of new plantings since 1965 has resulted in a resumption of the upward trend in bearing acreage.

The ideal conditions for peach production are cool winters, infrequent spring frosts, and warm summers free of fog and high humidity. Thus, the cling peach acreage in California is almost totally confined to interior valleys. Acreage in the Sacramento Valley centers at Marysville-Yuba City, extending northward to Live Oak and southward to Rio Oso along the Sacramento River. Three distinct districts are found in the San Joaquin Valley: Stockton, Modesto-Merced, and Kingsburg-Visalia-Lindsay. The Southern California district consists of two relatively small commercial districts—one east of Redlands and one near Hemet.

The districts in the San Joaquin Valley are of major and increasing importance, accounting for two-thirds of the bearing acreage of clingstone peaches in recent years—expansion in state acreage since 1940 can be accounted for primarily by increases in these districts. Further major expansion in California is likely to take place in these districts because their soils and climate are well adapted to cling peach production.

Heavy plantings in the 1920's in the Sacramento Valley resulted in a peak bearing acreage around 1930. Heavy pulling in the early 1930's reflected an inability of many producers to withstand the low prices of the depression period. Less important was the fact that the rapid expansion of the 1920's included plantings on some sites not adapted to peach growing. Since the middle 1930's, total bearing acreage of clingstone peaches in the Sacramento Valley has remained nearly constant. Possible expansion in the area is somewhat restricted by the acreage adapted to peach growing. Profitability of other crops, such as processing tomatoes, may also be a factor limiting future expansion of peach acreage in this region.

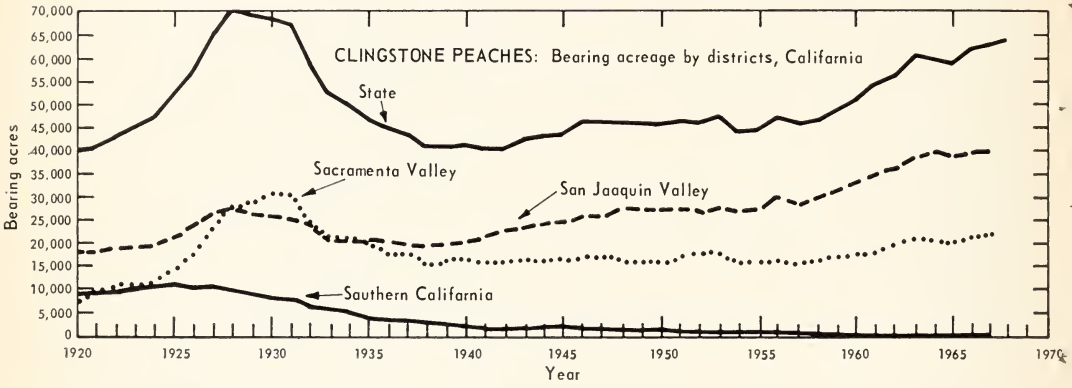
Southern California areas have declined

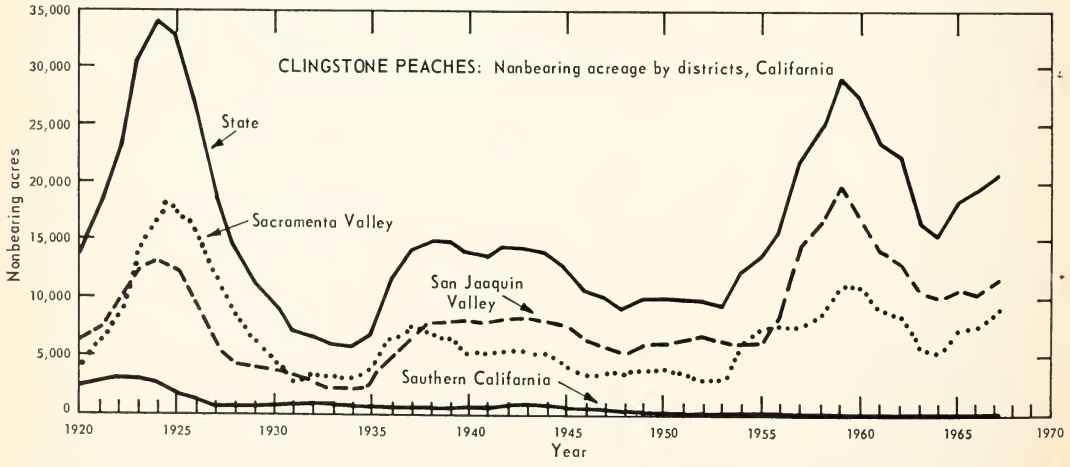
steadily and are now an insignificant portion of the state's total. Low yields and small fruits have been major factors in this decline.

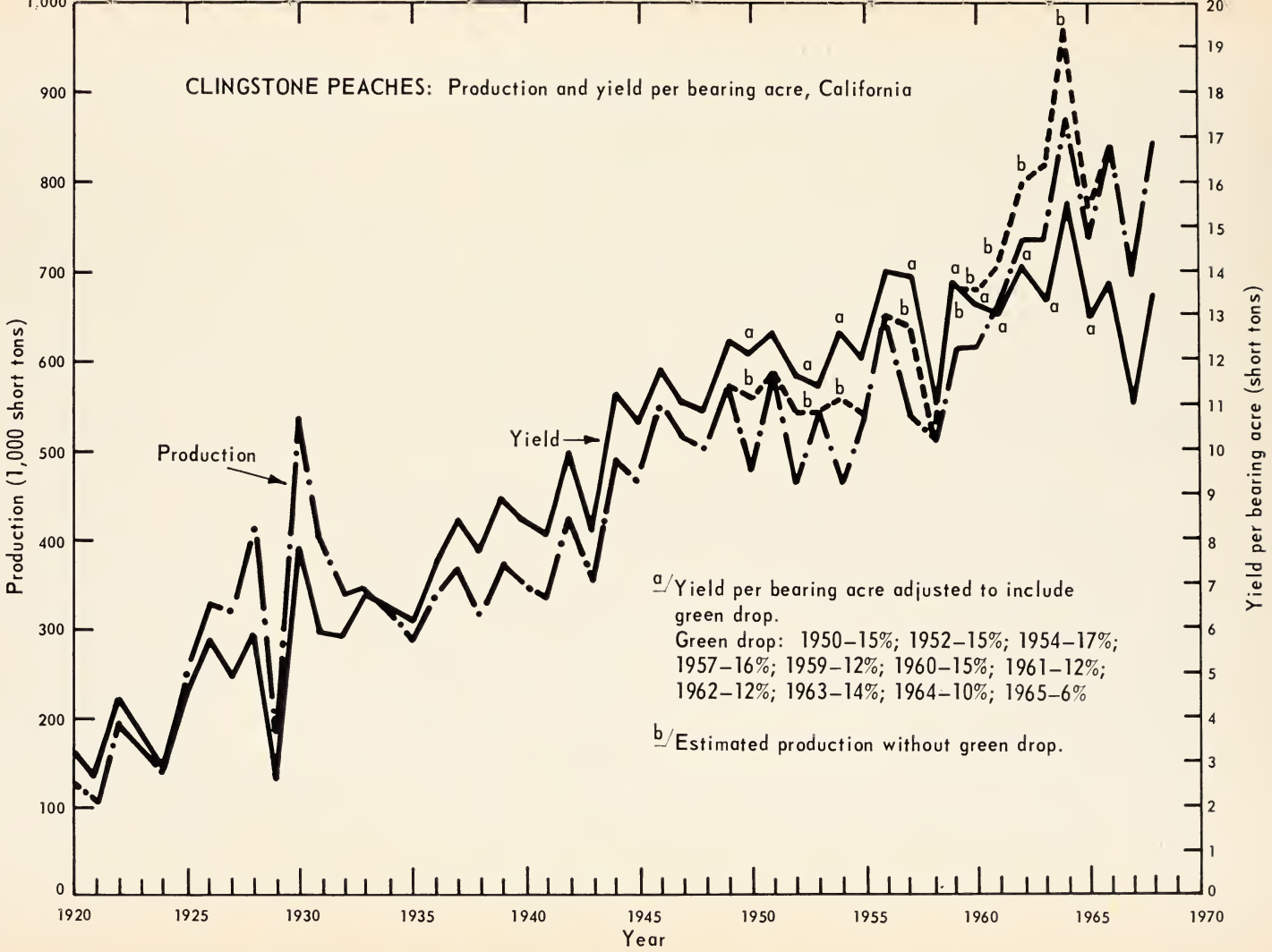
Trends in yields and production

Yields per bearing acre of California clingstone peaches have increased sharply, tripling in the last 40 years. The primary reasons are improved cultural practices, although improved varieties and younger orchards also exert a considerable influence on yields. Shifts of bearing acreage into the high-yielding districts of the San Joaquin Valley also increase state average yields. Year-to-year variations in yields are caused mainly by weather variations and a tendency toward alternate bearing.

During the 1920's, both bearing acreage and yield increased, resulting in a production peak in 1930. Between 1930 and 1935, acreage declines more than offset yield increases, with total production reduced. Since the late 1930's, with both yield and bearing acreage increasing, total production has increased. With bearing acreage and yields increasing slightly, total production in the near future will probably tend to increase.






CLINGSTONE PEACHES: Production and yield per bearing acre, California
Production (1,000 short tons)
Yield per bearing acre (short tons)
Year
Production
Yield
a/ Yield per bearing acre adjusted to include green drop.
Green drop: 1950–15%; 1952–15%; 1954–17%; 1957–16%; 1959–12%; 1960–15%; 1961–12%; 1962–12%; 1963–14%; 1964–10%; 1965–6%
b/ Estimated production without green drop.

FREESTONE PEACHES

General description of the industry

Freestone peaches are grown widely in the U. S., with 34 states recording significant commercial production. California is the leading state, producing about one-fourth of the supply. The other major competitive area is the east and southeast; South Carolina and Georgia together produce another one-fourth of the total U. S. crop. The utilization of the crop in California differs sharply from other states. In the rest of the nation practically the entire crop is sold fresh, but California sells only a little over one-third fresh. Another 40 per cent goes into canning—this figure has increased by about 12 percentage points in recent years. Drying has been decreasing. In the southeast there has been a sharp increase in early maturing, high-color varieties for fresh market. In California the major variety is the dual purpose Elberta, which can be sold fresh or canned. Thus, the prices of fresh and processed peaches tend to move together in California. Apart from Elbertas in California, acreage has tended to shift toward both earlier and later varieties in order to extend the marketing season. Because of the greater distance from eastern markets and the necessity for more careful packing for long hauls, farm prices are considerably lower in California than in the southeast. However, yields in California are on the average about double those in the southeast.

Changes in acreage and location of production

Low relative prices partially explain a downward trend in bearing acreage from the early 1920's to late 1930's. Sharp price declines discouraged new plantings and increased the rate of orchard removals. Stronger prices in the middle 1930's encouraged some new plantings and allowed bearing acreage to stabilize from about 1938 to the end of World War II. After a brief postwar decline, bearing acreage again stabilized at about 32,500 acres. However, more favorable grower prices and returns in the late 1940's and early 1950's brought on a sharp increase in new plantings in the late 1950's, and a subsequent reversal of the long-term decrease in bearing acreage. Increased competition from the southeast and lower relative prices sharply curtailed new plantings, and in 1961 bearing acreage once again began to decline.

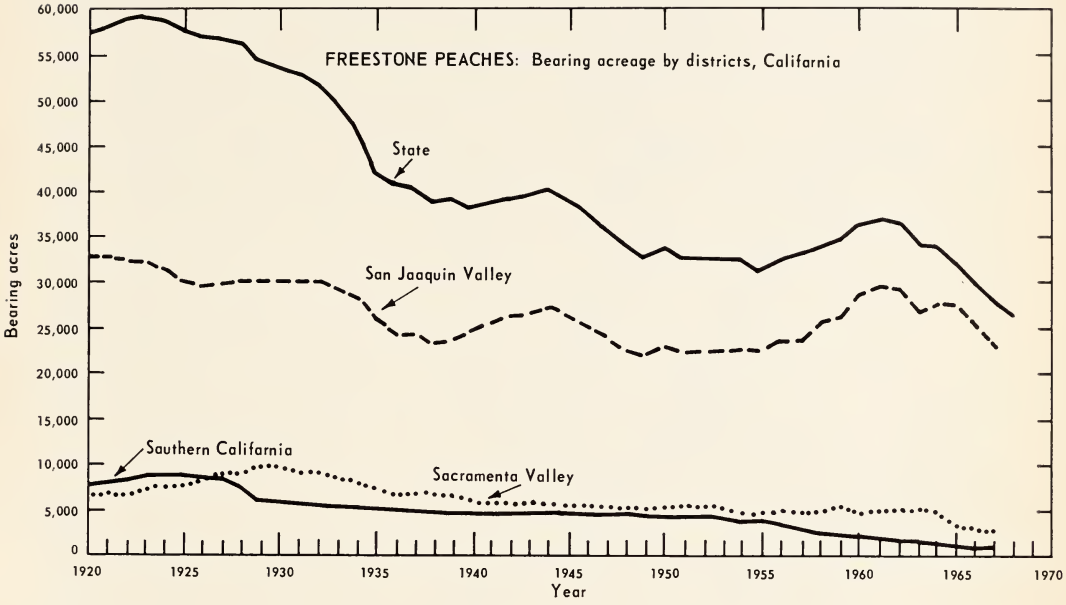
Most of the changes in bearing acreage of California freestones have been in the San Joaquin Valley districts (Fresno-Porterville and Modesto-Merced), though the Sacramento Valley districts (principally Winters and Fairfield) and southern California (Redlands, Banning, and Ontario) have also shown minor changes. Just as most of the changes have been in the San Joaquin Valley, any future expansions are expected to take place there. Recent increases in the Valley have been chiefly in Fresno, Kern, and Tulare counties, where early maturing varieties command a premium price. The southern San Joaquin Valley has a seasonal advantage in the fresh market, primarily because of an early ripening season.

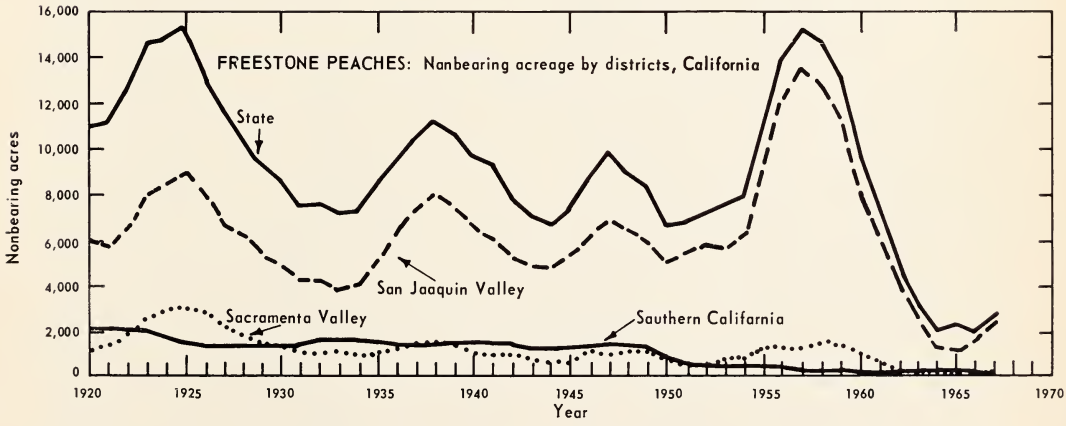
Trends in yields and production

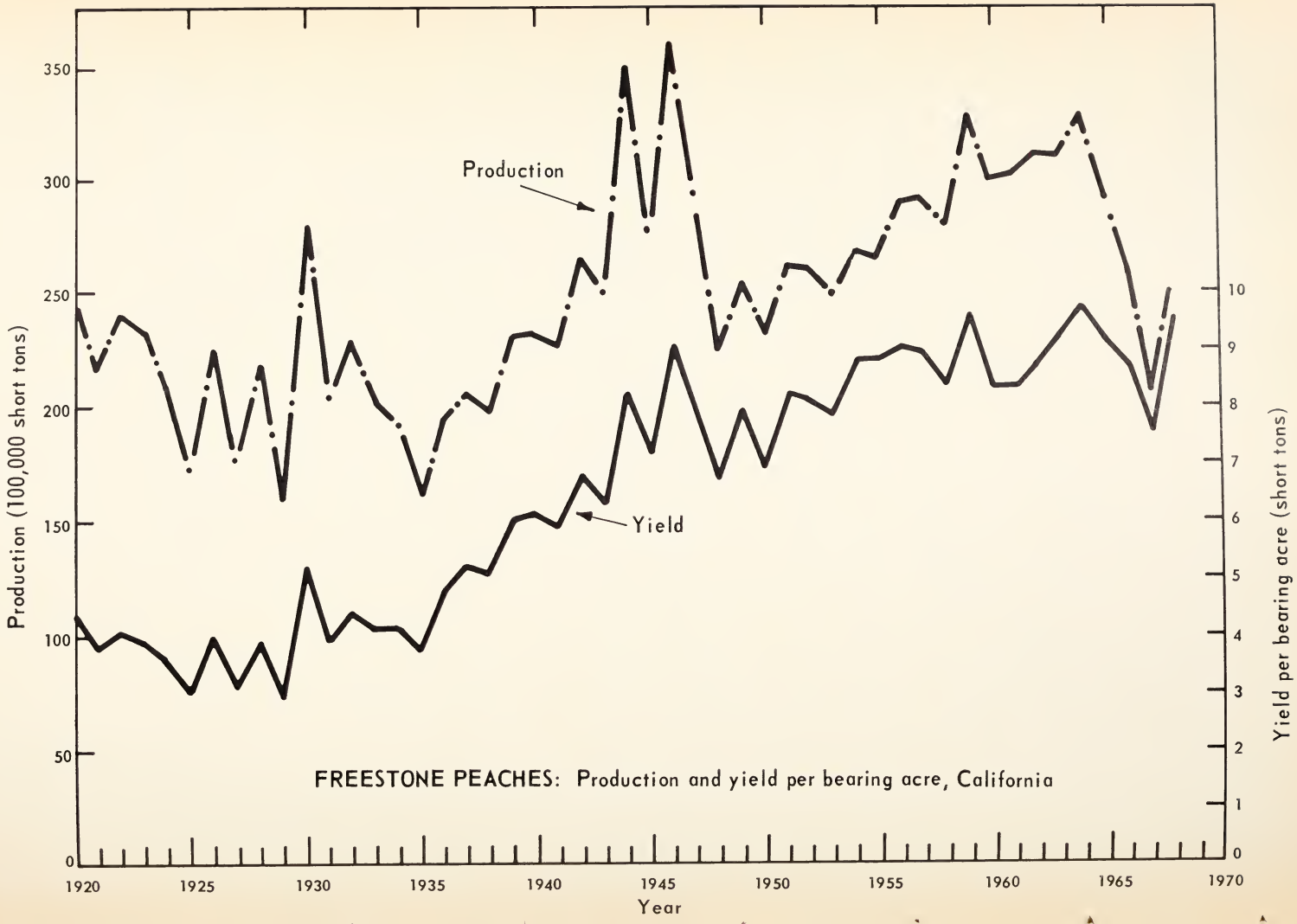
Little trend in yields of California freestone peaches can be observed from 1920 to 1935. However, improving prices during the late 1930's and World War II led growers to adopt improved cultural practices (such as better disease control), substantially increasing yields. Also, the plantings have been shifting toward better soils and usually toward more highly productive trees. Since 1935, average yields have increased by about 2 tons per acre every decade. Year-to-year yield fluctuations result primarily from weather variations and a slight tendency toward alternate bearing.

Freestone production in California declined between 1920 and 1935 as acreage declined and yields fluctuated about a con-

stant level. Then yield increases more than offset acreage decline, and production reached an all-time peak in 1946. After the early postwar drop in acreage, freestone yields and production once again started steadily upward, peaking again in 1964. With continued decline in bearing acreage and an apparent tapering off in yield increases, total production in the near future could decline from recent levels. However, if increases in the nonbearing acreage in the San Joaquin Valley in the past 2 years should continue, bearing acreage and production may be stabilized.







FREESTONE PEACHES: Production and yield per bearing acre, California

PEARS

General description of the industry

California produces approximately one-half of all pears produced in the U. S. Production outside California is concentrated primarily in Oregon, Washington, and Michigan. However, varietal composition and utilization of pears differs significantly among the three Pacific Coast states. Bartletts represent approximately 90 per cent of total pear tonnage in California but only 70 per cent in Washington and 40 per cent in Oregon. California cans about 72 per cent of the Bartletts produced and sells only 25 per cent fresh. In contrast, canning accounts for only 53 per cent of the crop in Washington and 23 per cent in Oregon. Most of California's fresh pears, because they mature earlier, are marketed before supplies from other states become heavy. However, canned pears from all states compete directly.

Several state and federal marketing orders, dealing with grades, sizes, and promotion, but not with volume control, are in effect for California pears. Recent increases in new plantings and expected future increases in production have created some interest in considering volume control legislation in the future.

Changes in acreage and location of production

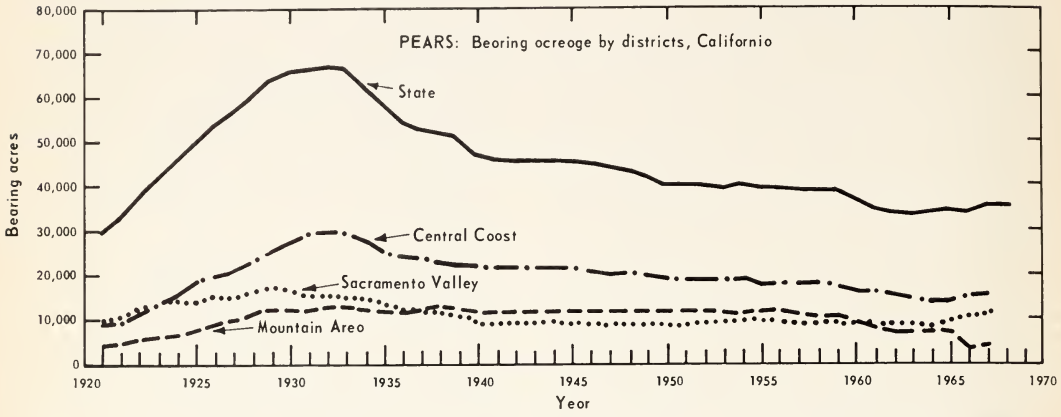
The sharp rise in bearing acreage of pears during the 1920's and early 1930's reflects a rapid rate of new plantings in the early 1920's in response to high prices and returns during the rapid growth of the California pear industry. Overexpansion of planted acreage and production, together with depression conditions, resulted in low returns to growers during the 1930's. Thus, both nonbearing and bearing acreage declined sharply until World War II. New plantings increased gradually in the postwar years, and then increased sharply in the late 1950's and early 1960's as it became apparent that many trees were being lost through pear decline. Short crop years in 1963, 1965, and 1967 resulted in exceptionally high prices and a continued high rate of new plantings. The rapid rate of new plantings has offset pullings of diseased trees, with the result that bearing acreage actually increased in 1965. The impact of pear decline appears to be diminishing because new rootstocks are less susceptible to the disease, and because of better control of the insect (pear psylla) which is the carrier of a virus causing pear decline.

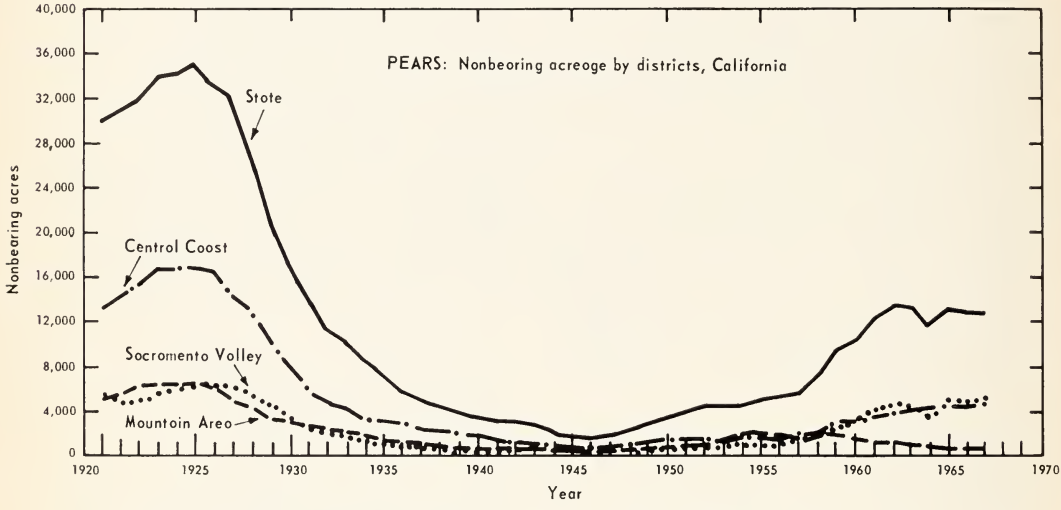
Pear decline has led to some sharp changes in the location of the pear industry in the state. The mountain counties of Placer and El Dorado have been especially hard hit: between 1956 and 1964 the share of the state's bearing acreage of pears in these counties dropped from 28 to 15 per cent. Acreage in the Santa Clara Valley has also diminished markedly due to subdivision for housing and industrialization. On the other hand, bearing and nonbearing acreage in the North Coast counties of Lake and Mendocino has increased sharply in recent years. Acreage in the Sacramento Valley (river district near Courtland and the Yuba City district) and the northern San Joaquin has also increased somewhat.

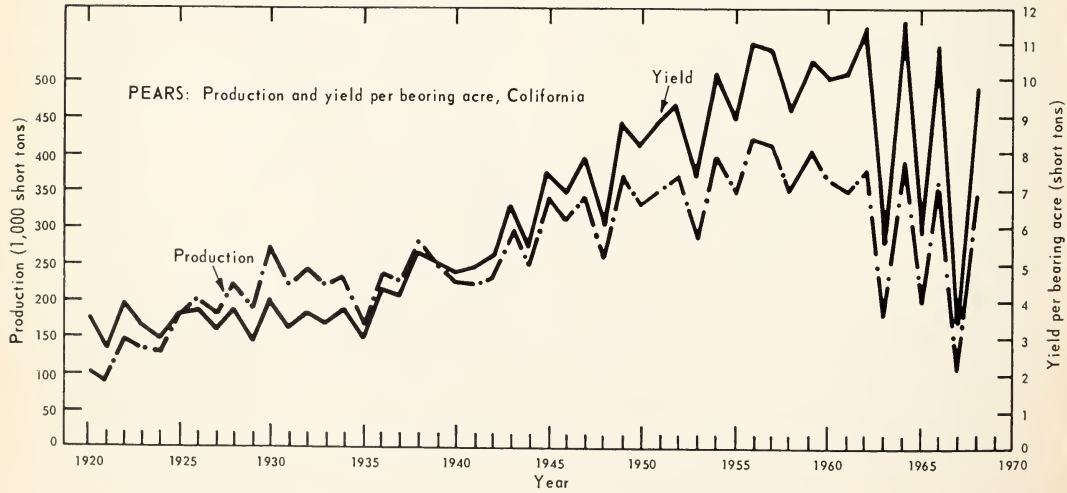
Trends in yields and production

Pear yields from 1920 to the mid-1930's remained about constant with only year-to-year fluctuations. From 1935 to 1955 yields per acre increased by two and one-half times. Most of this increase can be attributed to control of fire blight and the use of preharvest sprays; new varieties were not an important factor. Increasing maturity of existing orchards and more widespread irrigation also contributed to increased yields. The widespread incidence of pear decline since the late 1950's has caused average yields per acre to decline from the mid-1950 highs. Year-to-year yield fluctuations have been caused by an alternate bearing tendency and sensitivity to weather conditions. The years 1963, 1965, and 1967 saw particularly light crops due to unfavorable weather conditions. In

1967, rain during the blooming period caused a light fruit-set and the lowest yield and production since the 1920's; some orchards had practically no production. Total production will probably increase in the next few years as new plantings reach bearing age, and as yields recover from the effects of pear decline.







PLUMS

General description of the industry

Over 90 per cent of commercial plum production in the U. S. is concentrated in a few small acreas of California (Michigan produces the remainder). Although plums are highly perishable, about 95 per cent of the crop is utilized fresh, mainly in the heavily populated industrial region of the north-central and northeastern states and in local California markets. The remainder is mostly canned, although some plums are used for jam, jelly, and freezing.

Some 15 to 20 widely differing varieties are marketed successively throughout the season (May to September) depending on maturity dates. Supplies of competitive fruits are small when the early varieties are sold, but increase substantially after June when midseason and late plums are shipped. Recent years have seen a shift toward greater production of early varieties, partly as a result of competition with other fruits in the late season market.

Changes in acreage and location of production

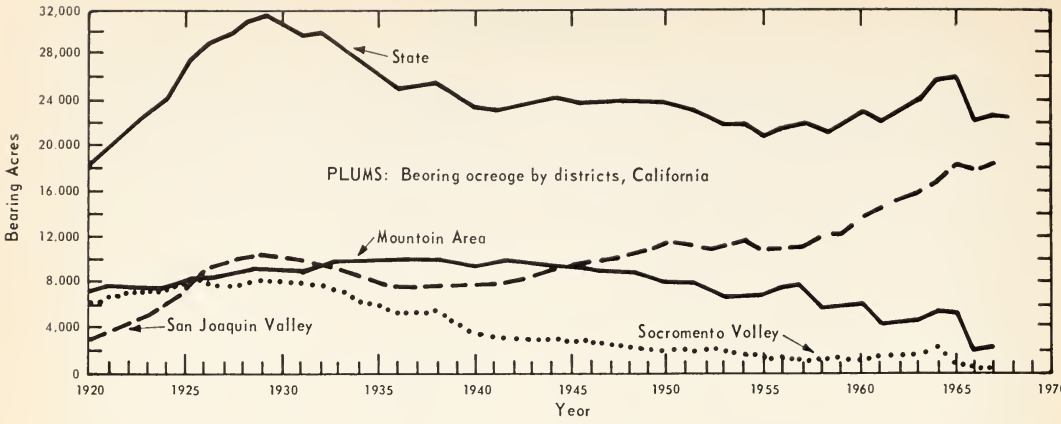
High prices received by plum growers after World War I led to an expansion of new plantings that continued into the early 1920's, with bearing acreage increasing until 1929. However, lower plum prices and reduced plantings in the late 1920's and early 1930's led to a decline, first in nonbearing acreage and then in bearing acreage. During World War II, increased demand and higher prices again stimulated new plantings. After the war, nonbearing acreage dropped, with the result that bearing acreage began to decline slowly after 1950.

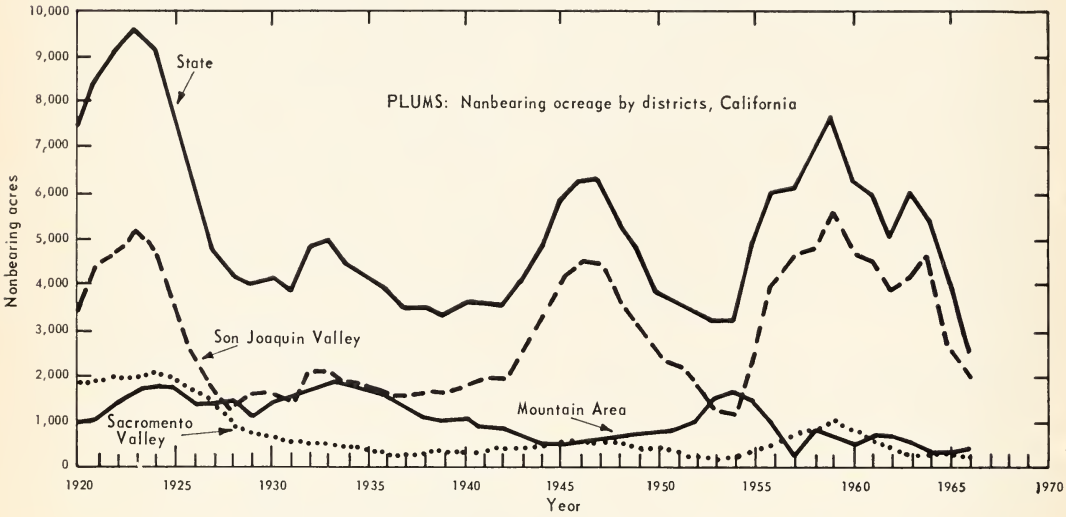
During the late 1950's, a surge of new plantings reversed the long-term downtrend in bearing acreage. Total bearing acreage increased substantially since 1958. However, pullouts in the mountain area since 1965 have once again reduced bearing acreage.

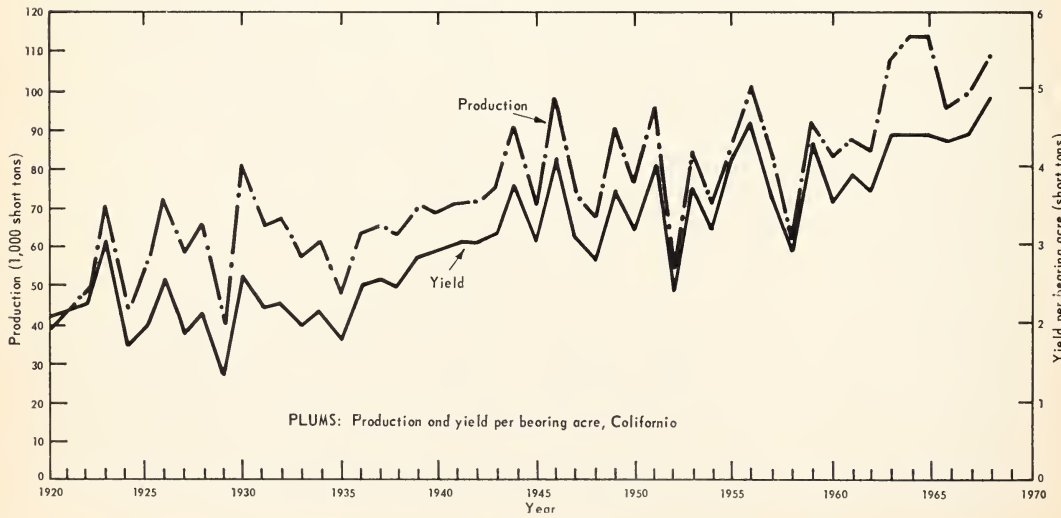
Since the mid-1930's, bearing acreage of plums has declined in the mountain area (Loomis-Auburn area of Placer County) and in the Yuba City area in the Sacramento Valley. Bearing acreage has shifted toward earlier maturing varieties in the San Joaquin Valley, particularly in the fruit belt from Clovis to Porterville. The Arvin area of Kern County and the Linden district of San Joaquin County are also important commercial plum-producing areas in the San Joaquin Valley. San Joaquin Valley producers, besides obtaining a tonnage per acre that is greater than average, grow a larger proportion of early maturing varieties which usually command more favorable prices. Even with the same varieties the San Joaquin Valley area permits earlier ripening than the Placer area or the Sacramento Valley. The geographic shifts in bearing acreage indicated above are expected to continue, as evidenced by increased new plantings in recent years in the San Joaquin Valley. Acreage in the Placer district and the Sacramento Valley will concentrate on late varieties, as competition from the San Joaquin Valley is not expected to develop during the late season when growers in that area are engaged in grape harvest.

Trends in yields and production

Little trend is evident in yields from 1920 to 1935, but yields have increased generally since. The primary reason for this has been the shift in location of production to the higher yielding San Joaquin Valley. Favorable weather conditions from the mid-1930's to mid-1940's helped the increases during that period. Wide annual yield fluctuations in other periods reflect variable weather conditions and the alternate bearing tendency of plums. Yield increases in the late 1930's and early 1940's more than counterbalanced the decline in bearing acreage; thus, production increased. Even though bearing acreage has declined since 1965, generally higher average yields could result in total production reaching or exceeding the record volume harvested in the 1964–65 crop years.


Bearing Acres
32,000
28,000
24 000
20.000
16.000
12.000
8.000
4.000
0
State
PLUMS: Beoring ocreoge by districts, California
Mountoin Area
San Joaquin Valley
Sacromento Volley
1920
1925
1930
1935
1940
1945
1950
1955
1960
1965
1970
Yeor


Nonbearing acres
10,000
9,000
8,000
7,000
6,000
5,000
4,000
3,000
2,000
1,000
0
State
PLUMS: Nanbearing ocreage by districts, California
Son Joaquin Valley
Sacromento Valley
Mountain Area
1920
1925
1930
1935
1940
1945
1950
1955
1960
1965
1970
Yeor


Production (1,000 short tons)
120
110
100
90
80
70
60
50
40
30
20
10
0
Yield per bearing acre (short tons)
6
5
4
3
2
1
0
Production
Yield
PLUMS: Production ond yield per beoring acre, Colifornio
1920
1925
1930
1935
1940
1945
1950
1955
1960
1965
1970
Year

PRUNES

General description of the industry

California accounts for about 90 per cent of the U. S. output of prunes with Washington, Oregon, and Idaho sharing the remainder about equally. The U. S. also dominates world production, producing nearly 75 per cent of the world output, followed by Yugoslavia (13 per cent), and France (4 per cent). Dried prunes are well suited for international trade and about 38 per cent of U. S. production moves into export channels, mainly to the United Kingdom and West Germany. If per capita consumption continues to decline in the U. S. and prospective increases in production in the next few years materialize, greater reliance on exports is likely. A large buildup in California nonbearing acreage has led to discussion of possible industry volume control in the near future.

The growing habits of the tree, and climatic requirements for ripening the fruit, confine its production to areas where the spring and summer are warm, dry, and clear. However, winter chilling is important to normal blossoming and leaf bud emergence. The interior valleys of California are well suited to prune production, as are some of the coastal valleys where fog is not excessive. In southern California, winters are generally too moderate for commercial prune production.

Changes in acreage and location of production

Bearing acreage in California increased over 50 per cent in 1920–1930, reflecting extensive new plantings during the first half of that decade. A rapidly expanding export market for dried fruits, together with excellent grower prices, largely accounted for this increase. Nonbearing acreage dropped drastically in the latter half of the 1920's, bringing about a steady decline in bearing acreage from 1930 to 1956. Depressed grower prices in the late 1920's and 1930's worked against expansion, and pullings exceeded new plantings during that period. A rise in nonbearing acreage since 1954 has led to a reversal, starting in 1957, of the long-term downtrend in bearing acreages. The relatively high degree of mechanization of prunes has apparently been a factor leading to its choice over competing fruit crops in recent years.

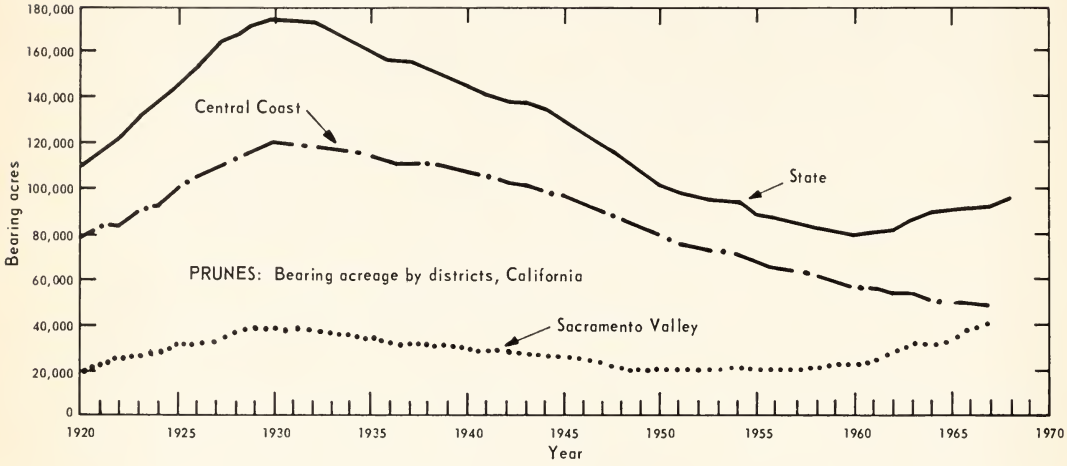
The central coast counties of Santa Clara (Santa Clara Valley), Sonoma (Santa Rosa–Healdsburg), and Napa (Napa–St. Helena) accounted for about 80 per cent of the total state bearing acreage until about 1950. Since 1950, however, importance has shifted from the coastal counties to the Sacramento Valley. Urbanization of the Santa Clara Valley has been chiefly responsible for this shift, though disease problems in Sonoma and Napa counties have also contributed. Major plantings in the Sacramento Valley center between Gridley and Rio Oso. Plantings are extensive north of Colusa and above the Sacramento River between Orland and Chico. Scattered plantings at Fairfield, Vacaville, and Woodland account for nearly all the remaining commercial acreage in the Valley. New plantings in recent years in the Sacramento Valley, primarily from Marysville to Red Bluff, account for a recent upturn in nonbearing acreage. Given the recent increase in nonbearing acreage in the Sacramento Valley, this area will likely become the major prune area of the state in the near future. Also, Tulare County, an old prune area in the San Joaquin Valley, has doubled its acreage in recent years.

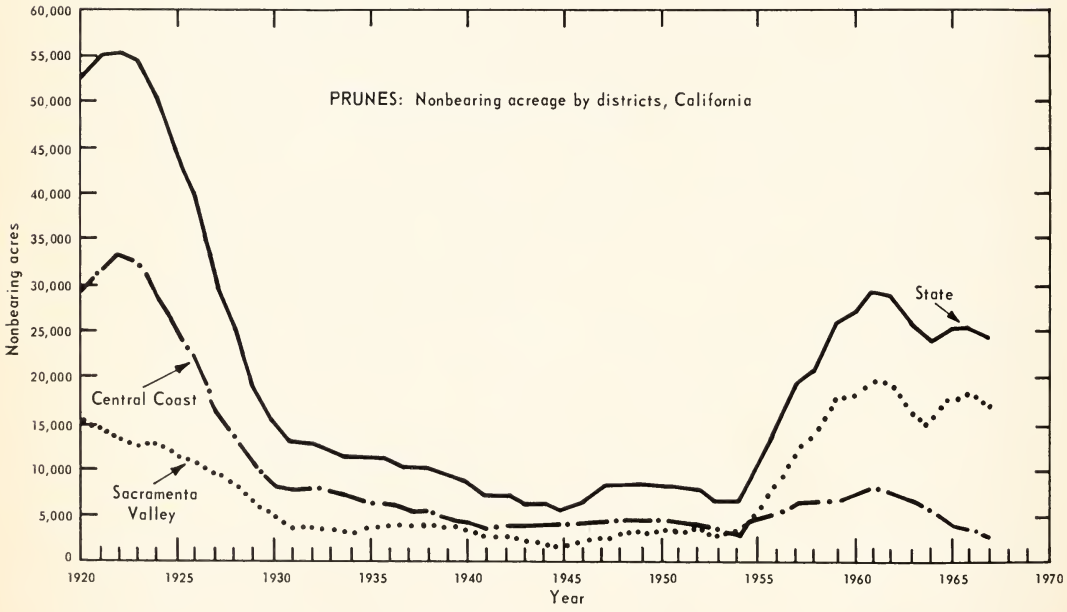
Trends in yields and production

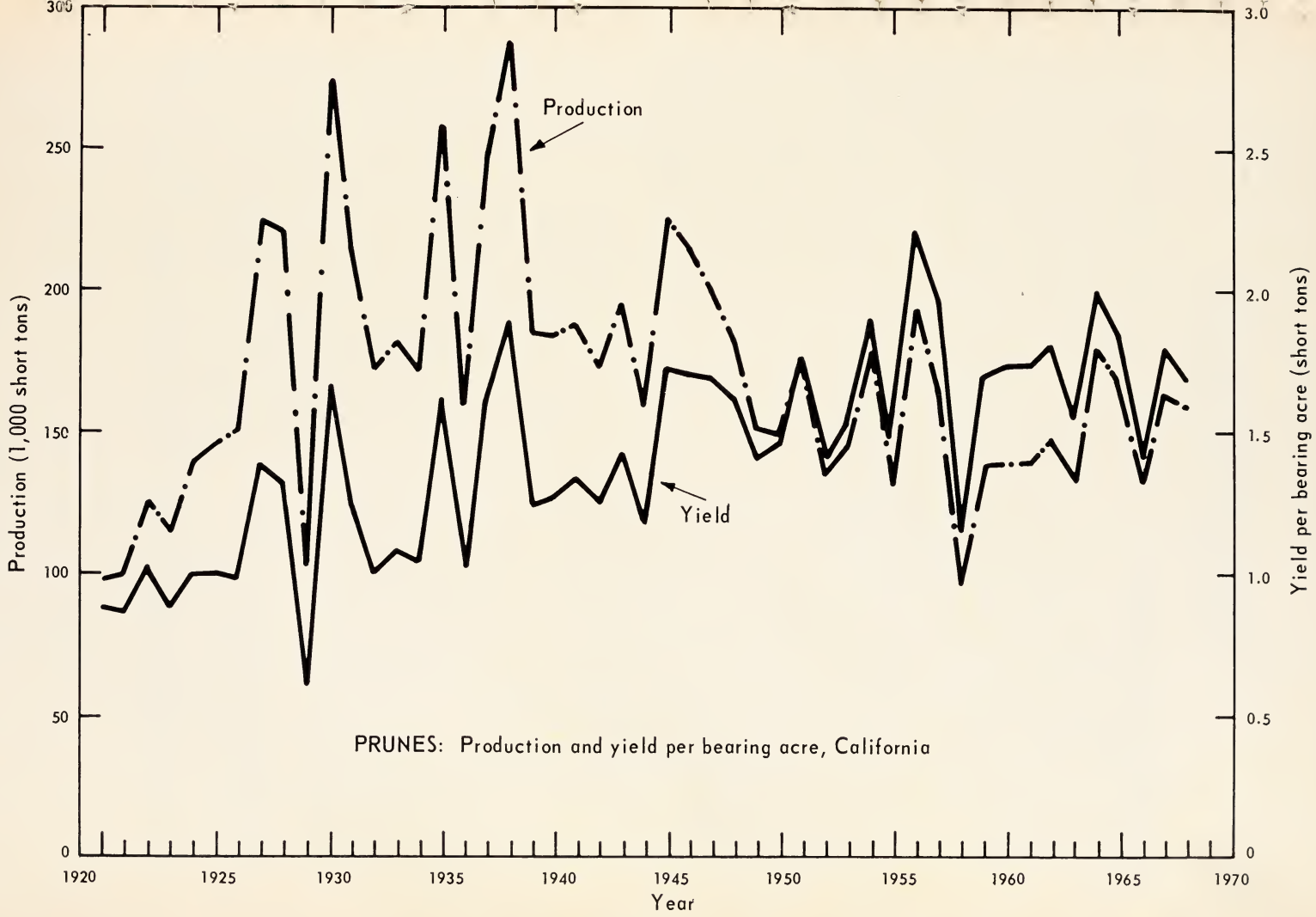
Yields of prunes have gradually increased in the past 35 years, though year-to-year fluctuations have been large. The shift in location of production can be expected to increase state average yields since yields are greater in the central valley than in the coastal counties. Because of a long lag between planting date and com-

mercial production, this shift will be reflected gradually in state average yields over time.

The upward trend in production in 1920–1938 partly reflects yield increases as trees matured. The trend since has been slightly downward, as acreage declines more than offset yield increases. With expanding acreage of higher yielding prunes in the Sacramento Valley, total prune production can be expected to increase significantly in the next few years.






Production
Yield
PRUNES: Production and yield per bearing acre, California
Production (1,000 short tons)
Yield per bearing acre (short tons)
Year
300
250
200
150
100
50
0
3.0
2.5
2.0
1.5
1.0
0.5
0
1920
1925
1930
1935
1940
1945
1950
1955
1960
1965
1970

GRAPEFRUIT

General description of the industry

The U. S. is the world's major producer of grapefruit, averaging getween 75 and 80 per cent of world production in the past few years. However, the nation's share of world production has dropped somewhat because of recent expansion in other countries, primarily Israel. Florida produces about three-fourths of the U. S. output, with Texas, California, and Arizona dividing the remainder about equally. A marketing order for grapefruit sets size and grade restrictions on sale.

A high percentage of the California-Arizona production goes into fresh use rather than processing; about 60 per cent of California's crop is sold fresh as compared to 40 per cent for Florida. The percentage of the crop going to the fresh market is critical, as prices in this outlet are from two to five times higher than those in the processed outlet. Also, California fruit commands a higher price in the fresh market because of its quality.

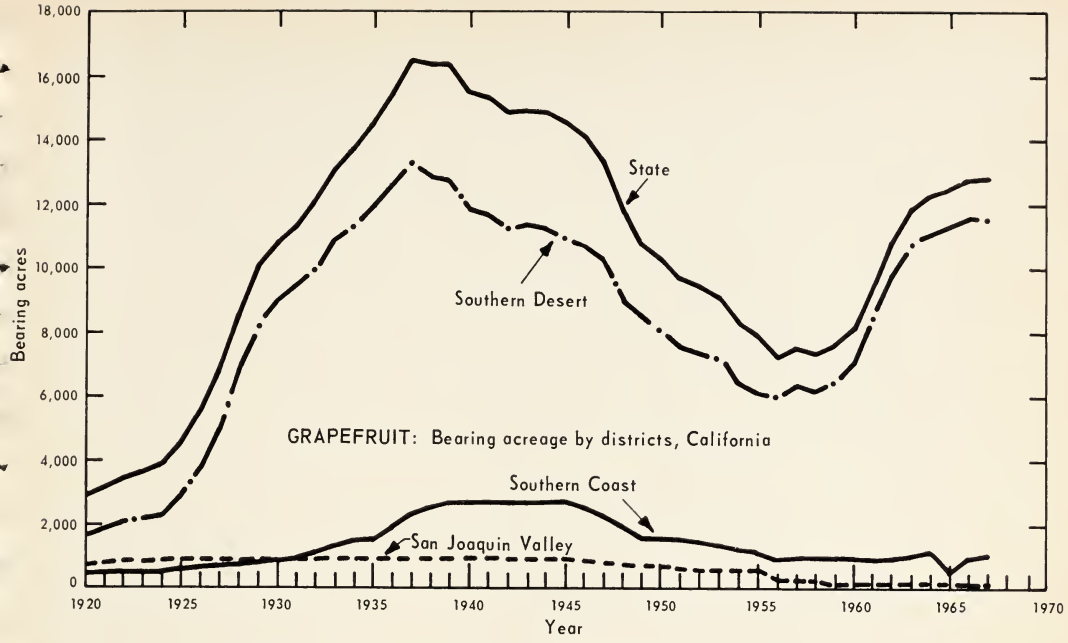
The white-fleshed Marsh seedless, the principal variety grown in California, is at its best in the desert areas and matures in winter and early spring. In other areas it matures more slowly and harvest is in June or later for best quality. Small quantities of Red Ruby and other pink varieties are also grown. Peak sales of fresh fruit are in the summer months.

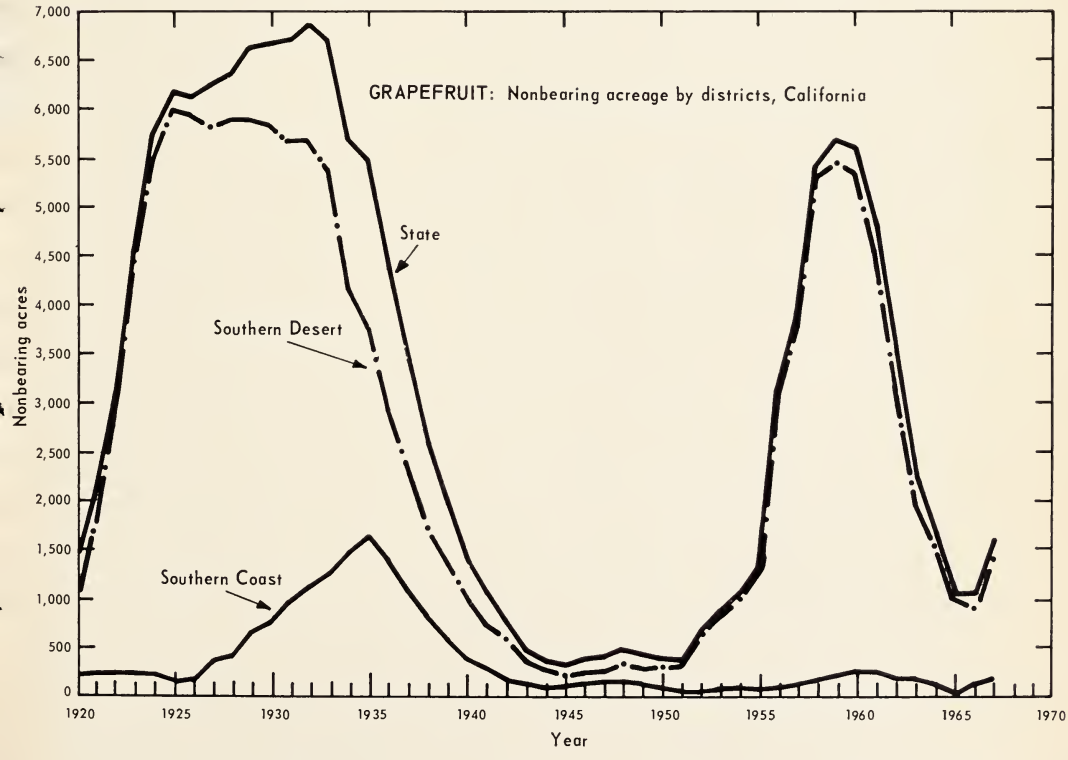
Changes in acreage and location of production

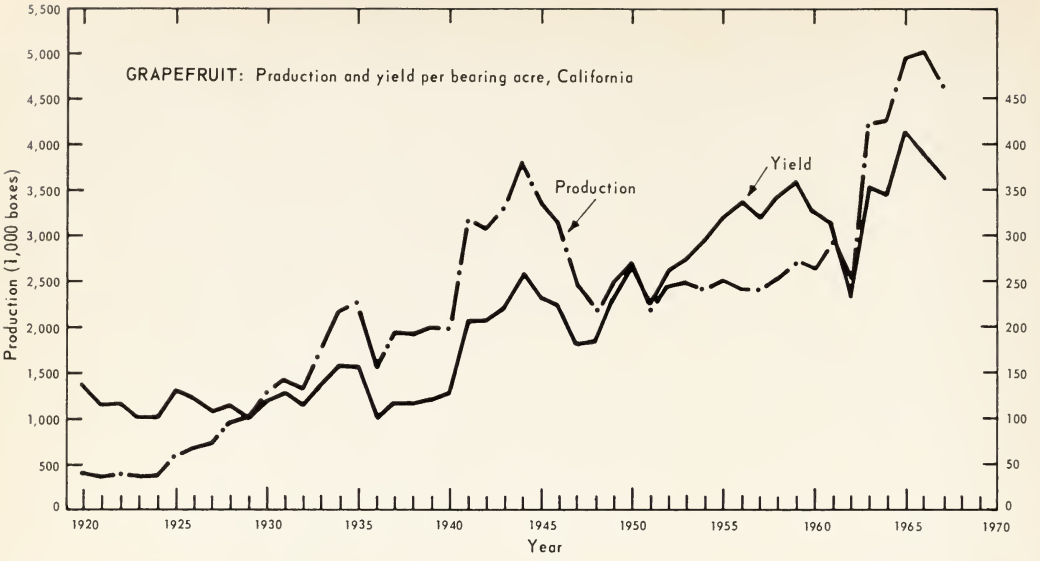
California's grapefruit acreage is located in two general areas. The first (called the Southern Desert) is made up of the desert valleys of Riverside (mainly the Coachella Valley) and Imperial counties. The second, of much less importance, is the Southern Coast area. The peak of bearing acreage was reached in the 1930's, followed by a long downward trend. In grapefruit, the decrease in acreage reversed in the late 1950's, primarily because of new postwar plantings in the Coachella Valley. Expansion here took place as a result of a good producing climate and nearness of the growing western market. Also, the winter desert climate attracted retired people and others who found it interesting and profitable to invest in new grapefruit orchards—which were then operated by local management firms. Southern California and San Joaquin Valley acreage has gradually declined and there appears to be little interest in substantial new plantings in these areas.

Trends in yields and production

The long-term trend in grapefruit yields has been strongly upward, with recent yields over twice those before 1940. Increased yields since 1940 reflect improved cultural practices, but also are the result of removal of trees in lower-yielding areas and recent plantings in favorable areas of the Coachella Valley. With rising yields and the upward turn in bearing acreage, total production increased sharply in the 1960's. However, new plantings have dropped off in the past 3 or 4 years so that bearing acreage should tend to stabilize at the new higher level. Total production will probably increase somewhat due to higher expected yields.


18,000
16,000
14,000
12,000
10,000
8,000
6,000
4,000
2,000
0
Bearing acres
State
Southern Desert
GRAPEFRUIT: Bearing acreage by districts, California
Southern Coast
San Joaquin Valley
1920
1925
1930
1935
1940
1945
1950
1955
1960
1965
1970
Year


7,000
6,500
6,000
5,500
5,000
4,500
4,000
3,500
3,000
2,500
2,000
1,500
1,000
500
0
Nonbearing acres
GRAPEFRUIT: Nonbearing acreage by districts, California
State
Southern Desert
Southern Coast
1920
1925
1930
1935
1940
1945
1950
1955
1960
1965
1970
Year



LEMONS

General description of the industry

California accounts for over 90 per cent of the U. S. lemon production; the remainder of the production is in Arizona, which has increased in importance relative to California in the past 10 years. A substantial amount of international trade in lemons and lemon products exists. The U. S. and Italy each account for roughly one-third of world production, with the remaining one-third scattered through other Mediterranean countries. World production has nearly doubled in the past 20 years, during which time the U. S. has lost considerable ground to foreign producers, particularly to Italy.

Prior to 1950, the crop was marketed primarily in fresh form. Since the development of frozen lemonade concentrate (beginning in 1950) and expanded utilization of single-strength lemon juice, a new type of market situation developed. California's high-quality lemon for fresh consumption lost some of its competitive advantage, and imports of lemon juice have increased. A federal marketing order regulates shipments in the price-sensitive primary fresh market, with the remainder of the crop diverted to processed uses. Thus, the quantities shipped in the fresh market tend to be relatively stable with the large fluctuations in quantities processed, depending on size of the crop. In recent years about 40 per cent of the California crop has been processed.

Changes in acreage and location of production

Past trends in bearing acreage are closely associated with nonbearing acreages, with proper allowance for plantings to reach bearing age. Bearing acreage remained constant from 1920 to 1934. However, in-

creased plantings following the relatively high-income years of the 1920's led to greater bearing acreage in the mid-1930's, reaching a peak at the close of World War II.

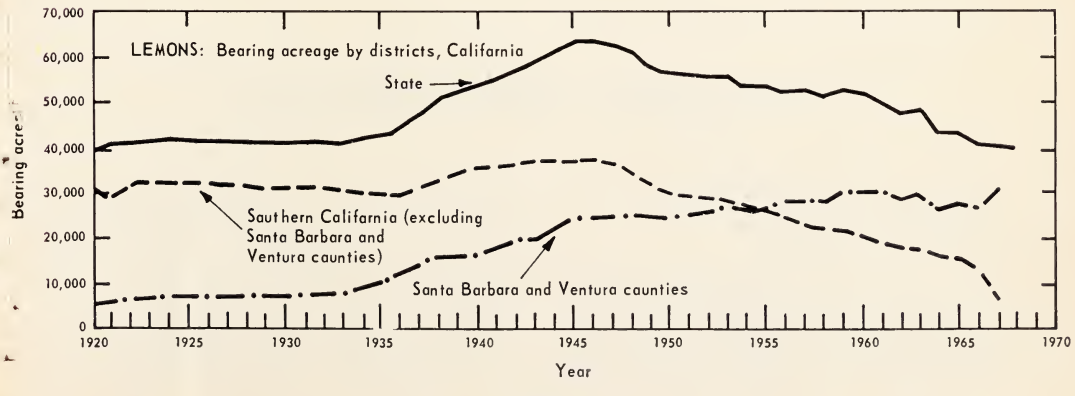
After reaching a peak in 1946, the bearing lemon acreage in California dropped continuously, mainly because of urbanization in the old lemon-producing areas of southern California and generally insufficient returns to induce new plantings. Nonbearing acreage has, however, been responsive to prices and grower returns. Two short crops in 1949–1949 and 1949–1950, rapid consumer acceptance of concentrates, and the operations of the state marketing order for products resulted in raising prices and returns during the early 1950's, and induced a substantial increase in new plantings. However, returns in the late 1950's dropped, and low returns from 1958 to 1965 caused new plantings to dwindle. Thus, bearing acreage has dropped rapidly since 1963.

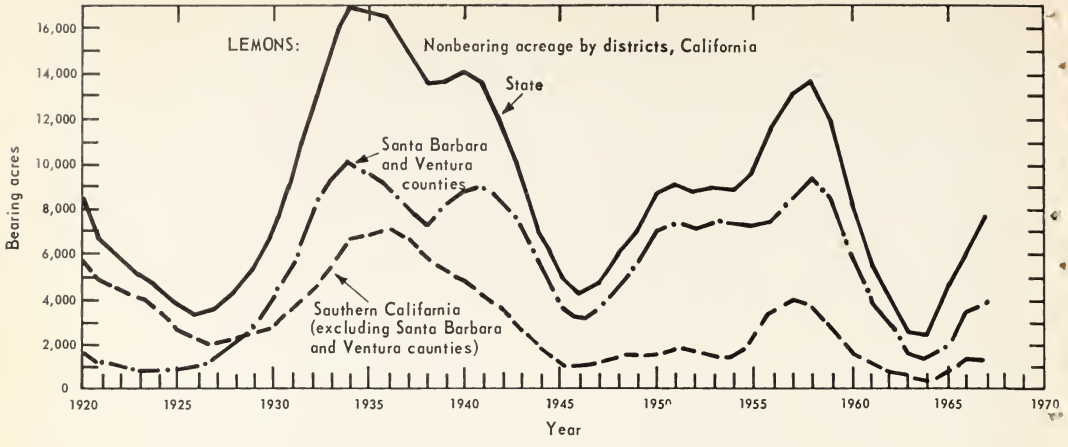
The location of lemon acreage within California has shifted markedly. Only certain localized areas, primarily in southern California, are well suited to commercial lemon growing. The coastal plains of Ventura and Santa Barbara counties have become the most important producing areas, while aggregate acreage elsewhere in southern California has declined. Main reasons for the shift apparently are relocations forced by urbanization and relatively higher yields in Ventura and Santa Barbara counties. Recent plantings in the Coachella and other desert valley districts also have added to nonbearing acreage.

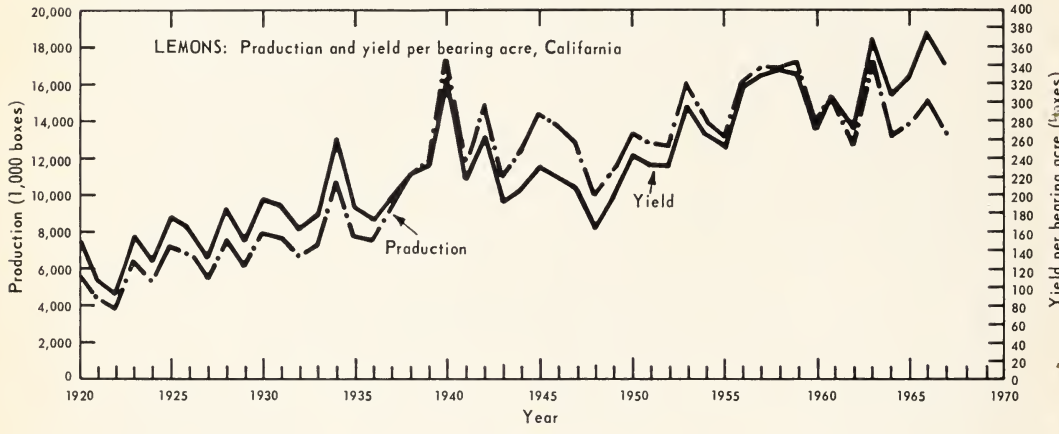
Trends in yields and production

Lemon yields increased strongly from 1920 to 1940. Peak yields in 1940 resulted from an acreage shift to higher-yielding Santa Barbara and Ventura counties, improved care of trees, and (possibly) very favorable weather conditions. Increasing yields during the prewar period were due in part to improved orchard management and production practices, particularly pest and disease control, better protection against adverse climate, and improved soil management and fruit handling methods. Yields in 1940–1950 were somewhat lower because of less favorable weather. Damaging freezes in 1948 and 1949 depressed yields in those years. Since 1950 yields have again resumed a general upswing, with some variation from year to year due to weather. In postwar years the number of trees per acre has been increased and improved strains of disease-free lemons have been adopted—this will probably contribute to further increases in yield per acre.

Production trends are a direct result of the bearing acreage and yield trends discussed above. Production rose from 1920 to 1940, primarily from increasing yields but also from some increase in acreage. Declining yields during the 1940's were nearly offset by the rise in bearing acreage. Since 1950 yield increases have about offset acreage declines, with production ranging from 12.5 to 17.1 million boxes, depending on the weather.







NAVEL ORANGES

General description of the industry

Navel oranges are winter oranges shipped mainly from November through April and used primarily for fresh consumption. In recent years, about 85 per cent of the California crop has been shipped fresh; hence competition from processed oranges from Florida has had less impact on California navels than on California Valencias. The acreage and production decline in navels in California has been less drastic in the past 20 years than for Valencias. In the

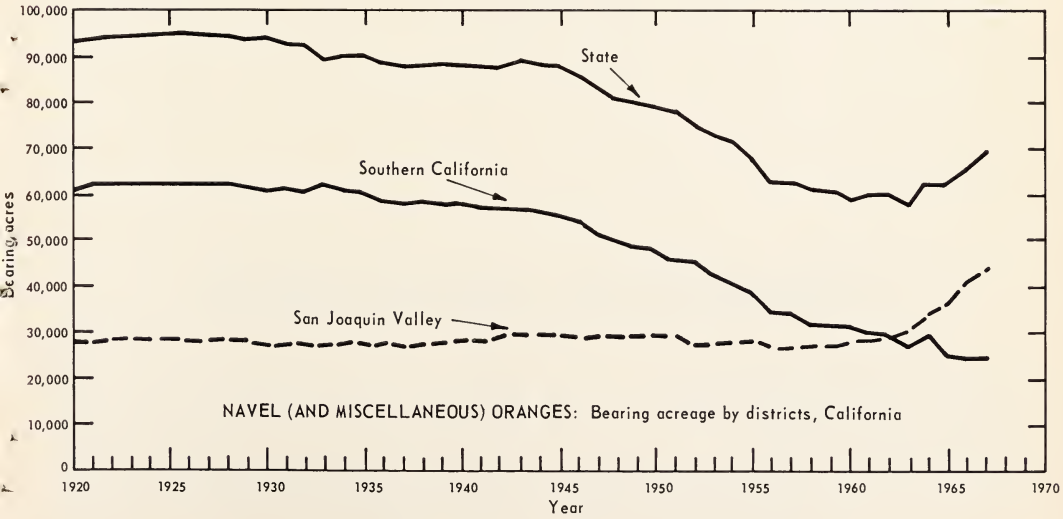
mid-1960's, the total acreage and production of the two varieties have been about equal. As Valencia oranges shift into the San Joaquin Valley, they will move more directly in competition with navels in the February to May period. This increased overlapping of seasons and varieties due to shifts in location of acreage in the state is one of the major problems facing the industry in the years ahead.

Changes in acreage and location of production

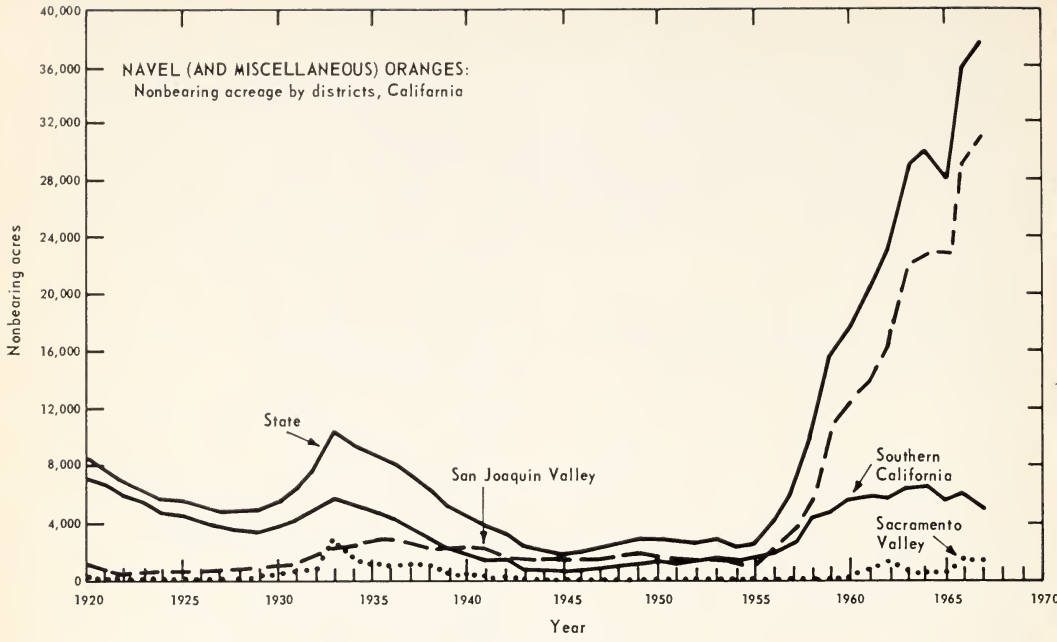
Increased competition from Florida fresh oranges, and from processed fruit, resulted in little replanting of southern California navel orchards forced out of production by urbanization and industrialization during the first decade of the postwar period. Grower returns during the period were generally not sufficiently attractive to induce major new plantings. However, with development of new surface water supplies on the east side of the San Joaquin Valley and better grower returns in the late 1950's, new plantings in the area spurted to all-time peaks. A modest increase in new plantings has also taken place in new areas of southern California. However, bearing acreage in the San Joaquin Valley now exceeds that in southern California, and the gap will become wider as new plantings reach bearing age. In the Sacramento Valley, damaging freezes followed heavy plantings in the early 1930's, preventing this area from becoming a major producing area even though isolated plantings remain. Foothill plantings in Butte and Sacramento counties are generally in thermal belts. The major acreages in Glenn County, however, receive supplementary heating. New plantings in the Sacramento Valley which have been made have not been large in absolute terms.

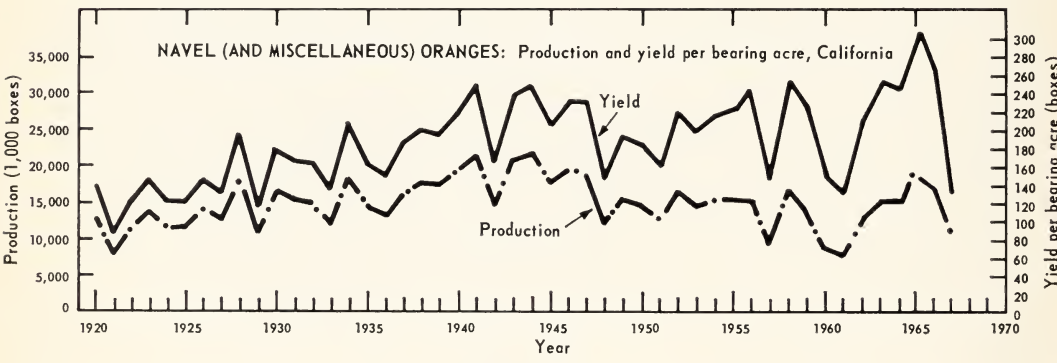
Trends in yields and production

Yields of navel oranges have followed the same general trend as yields of Valencia oranges. Similarly, the uptrend from 1920 to World War II was largely caused by improved cultural practices and the maturing of orchards. A leveling-off of yields since World War II reflects increased age of orchards (many being past peak production) and, possibly, less favorable growing conditions. Average yields per acre can be expected to rise as the majority of acreage moves to the higher yielding central districts. However, year-to-year variability due to weather conditions will likely be greater in these new areas—for example, low 1967 yields were due to severe freezing in San Joaquin Valley districts. Because of the sharp increase in new acreage in the San Joaquin Valley, industry sources are projecting a 50 per cent increase in production over the 1965-1970 period.



NAVEL (AND MISCELLANEOUS) ORANGES: Bearing acreage by districts, California





VALENCIA ORANGES

General description of the industry

The U. S. is the major orange-producing country of the world, accounting for about 30 per cent of the world supply in recent years. However, practically the entire crop is consumed in the U. S. and Canada. Changes in the California orange industry have been dramatic over the years, and are

closely related to developments in orange production and marketing in other sections of the country, particularly in Florida. Especially influenced have been California Valencias, about 85 per cent of which were shipped annually for fresh consumption prior to World War II. (An even higher percentage of Florida oranges were shipped fresh during the prewar period.) During this period, California Valencia growers generally received favorable prices and returns. After the war the picture for California Valencias changed drastically as development of frozen orange concentrate, and the resultant boom in acreage and production of processing oranges in Florida, reduced returns to California producers. Frozen concentrate became widely accepted as a year-round substitute for fresh orange juice, sharply reducing the seasonal advantages of California Valencias. Today, about 60 per cent of California Valencias are still consumed fresh. However, processed production has expanded to the point where around 75 to 80 per cent of the Florida crop is utilized in this outlet.

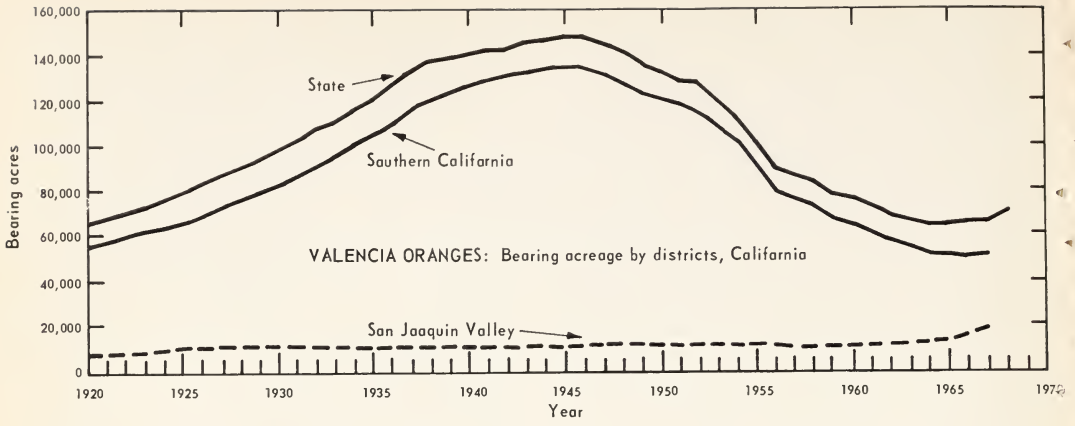
Changes in acreage and location of production

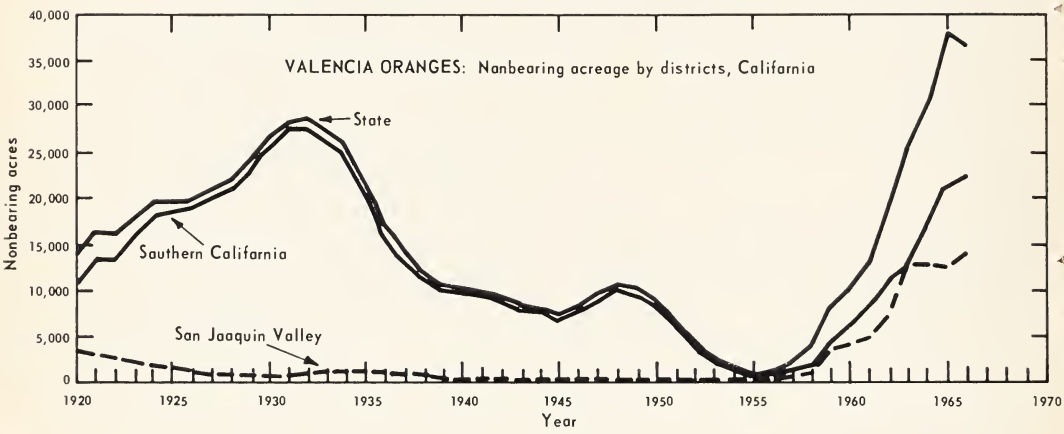
With demand reduced and production costs higher than in Florida, the total bearing acreage of California Valencias dropped off sharply, reaching a low in 1964—about half the level of the peak acreage 20 years earlier. In contrast, the bearing acreage in Florida increased from about 250,000 acres to around 450,000 acres in the peak year, 1961–1962. Until the last decade nearly all of the change in bearing acreage of California Valencias has taken place in southern California. Principal districts are Ventura County, Orange County, and Corona-Arlington-Redlands. Bearing acreage in the San Joaquin Valley (mainly the Woodlake-Porterville district of Tulare County) has been relatively constant from the early 1920's until the past few years. The sharp decline in California's bearing acreage since 1946 can be traced directly to southern California, where many orchards have been pulled because of residential and industrial expansion. With higher profit alternatives available for land, replantings of Valencias in southern California have not kept pace with removals. Since the late 1950's there has been a significant increase in new plantings in southern California and in the San Joaquin Valley districts. The long-term downtrend in bearing acreage appears to be reversing and industry sources are projecting an increase in supplies of Valencias by 30 to 40 per cent in 1970 over the 1960–1965 average. Because a larger relative share of the crop will come from the San Joaquin Valley, there is likely to be an increase in the problems of seasonal overlapping in marketing with navel oranges.

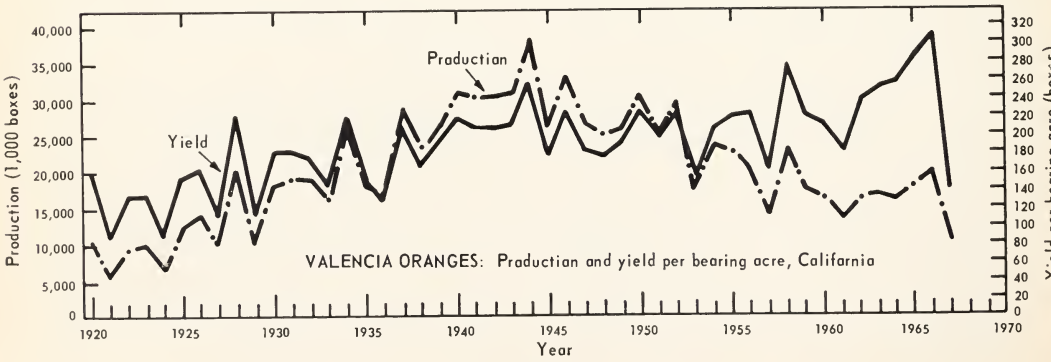
Trends in yields and production

Although the yield of Valencia oranges has been highly variable, the general trend was upward until about World War II. Increased yields mainly reflect improvements in pest and disease control, soil management, and other cultural practices, as well as the greater yielding capacity of maturing trees. Postwar yields have not generally increased, partly because many of the orchard removals in southern California have been in the highest yield areas and partly because of unfavorable weather conditions in several years, particularly 1953, 1957, 1961, and 1967. The extremely low yields in 1967 were the result of unfavorable weather during the period of bloom and pollination, coupled with further losses from freezing temperatures in December and January. However, the newer plantings in recent years contain more trees per acre and may result in increased future yields as these trees come into bearing.

The upward trend in total production until World War II reflected increases in both bearing acreage and yields. A relatively constant general yield level since World War II, plus declining bearing acreage, resulted in a marked decrease in production until the 1960's. With bearing acreage on the increase and yields steady or increasing, the short-term outlook is for a reversal of the long-term downtrend in total volume of production.


160,000
140,000
120,000
100,000
80,000
60,000
40,000
20,000
0
Bearing acres
State
Southern California
VALENCIA ORANGES: Bearing acreage by districts, California
San Joaquin Valley
1920
1925
1930
1935
1940
1945
1950
1955
1960
1965
1970
Year


40,000
35,000
30,000
25,000
20,000
15,000
10,000
5,000
0
Nonbearing acres
VALENCIA ORANGES: Nonbearing acreage by districts, California
State
Southern California
San Joaquin Valley
1920
1925
1930
1935
1940
1945
1950
1955
1960
1965
1970
Year


40,000
35,000
30,000
25,000
20,000
15,000
10,000
5,000
0
Production (1,000 boxes)
320
300
280
260
240
220
200
180
160
140
120
100
80
60
40
20
0
Yield per bearing acre (boxes)
Production
Yield
VALENCIA ORANGES: Production and yield per bearing acre, California
1920
1925
1930
1935
1940
1945
1950
1955
1960
1965
1970
Year

AVOCADOS

General description of the industry

The avocado is an evergreen, subtropical fruit tree whose commercial culture is limited to areas with relatively mild winters. Southern California produces 80 per cent of the U. S. domestic production, and Florida is the other principal supplier. Prior to 1961, substantial quantities (about 10 per cent of U. S. consumption) were imported into the U. S. from Cuba during the summer months.

Avocados are harvested every month of the year in California, but in recent years, nearly 60 per cent of the California crop was shipped during December through May. The year-round harvest in California is primarily due to differences in maturity dates between varieties and climatic differences between districts. The fact that avocados may be stored on the trees after initial maturity also lengthens the season.

Two varieties of avocados dominate California's production. About 60 per cent of production is of the Fuerte variety, a green-skinned fruit, produced principally in San Diego County and marketed during November through June. Until the mid-1950's, the Fuerte accounted for 70 to 85 per cent of total California production, but the Hass variety has increased in importance and now accounts for about 30 per cent of production. The Hass is a dark-skinned fruit, marketed mainly during June through October, and is the principal variety produced in the northern counties of southern California.

As recently as 10 years ago, over 100 varieties of avocados were produced in California. Industry concern with marketing quality fruit, and with reducing the variation in the type of fruit on the market so as to display a more uniform and recognizable product, led to an ambitious program of variety improvement which started in 1965. At present, only four varieties—the Fuerte, Hass, Bacon, and Zutano—are recommended for commercial planting in California. The reduction in varieties recommended for commercial culture will facilitate harvesting and packing as well as marketing. In addition, the California avocado industry operates under a state marketing order designed to increase the demand for California avocados through a comprehensive trade promotion and advertising program financed by grower assessments.

Florida's production is marketed mainly from September through January. Acreage reached its peak in the mid-1950's, but has declined due to recent freezes and hurricanes. Production has varied widely as a consequence of these natural disasters and, in recent years, has ranged from a high of 13.9 million tons in 1963 to 2.8 million tons in 1965. No marked increase in acreage is foreseen for the next 10 years.

The traditional outlet for fruit has been fresh usage. The recent development of a new process for the commercial freezing of avocados allows them to be stored for a year or more and permits the marketing of a ready-to-serve product. This may result in an expanded use by restaurants, airlines, and other institutional users, and may, therefore, give more stability to producer prices.

Changes in acreage and location of production

California currently has nearly 19,000 acres of bearing avocados planted primarily in three production areas in southern California. The major producing regions are: San Diego County; Mid-counties (Los Angeles, Orange, Riverside, and San Bernardino); and North counties (Ventura and Santa Barbara).

Total California bearing acreage increased from 560 acres in 1925 to about

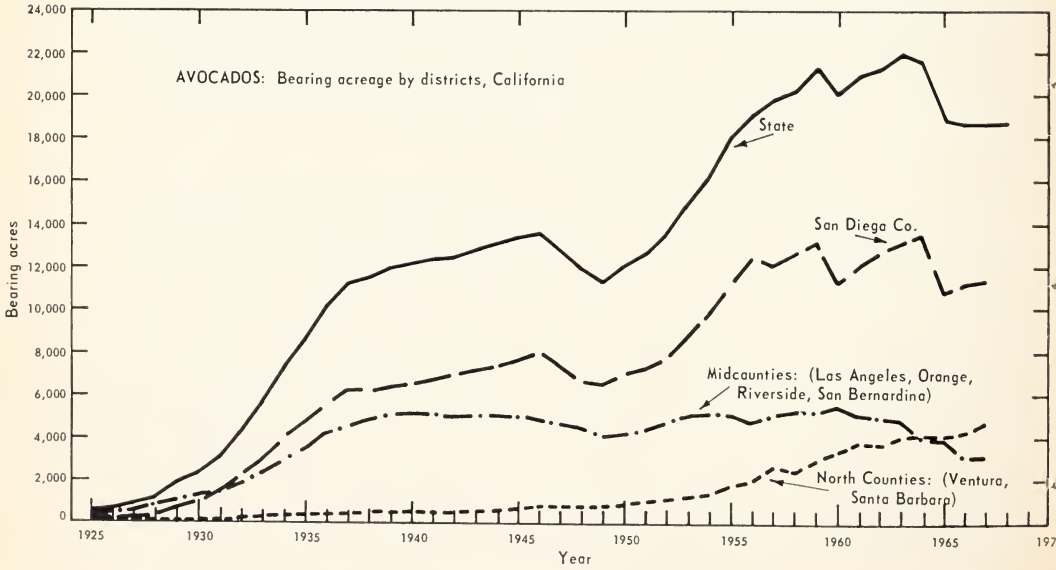
12,000 acres in 1940. Bearing acreage showed relatively little change over the period of 1940–1950. A second period of large new planting of avocados in the early 1950's resulted in a large increase in acreage from about 11,000 acres in 1950 to nearly 22,000 acres in 1963. Present bearing acreage in California is near 19,000 acres; the low nonbearing acreage does not indicate a substantial increase in producing (bearing) acreage in the near future.

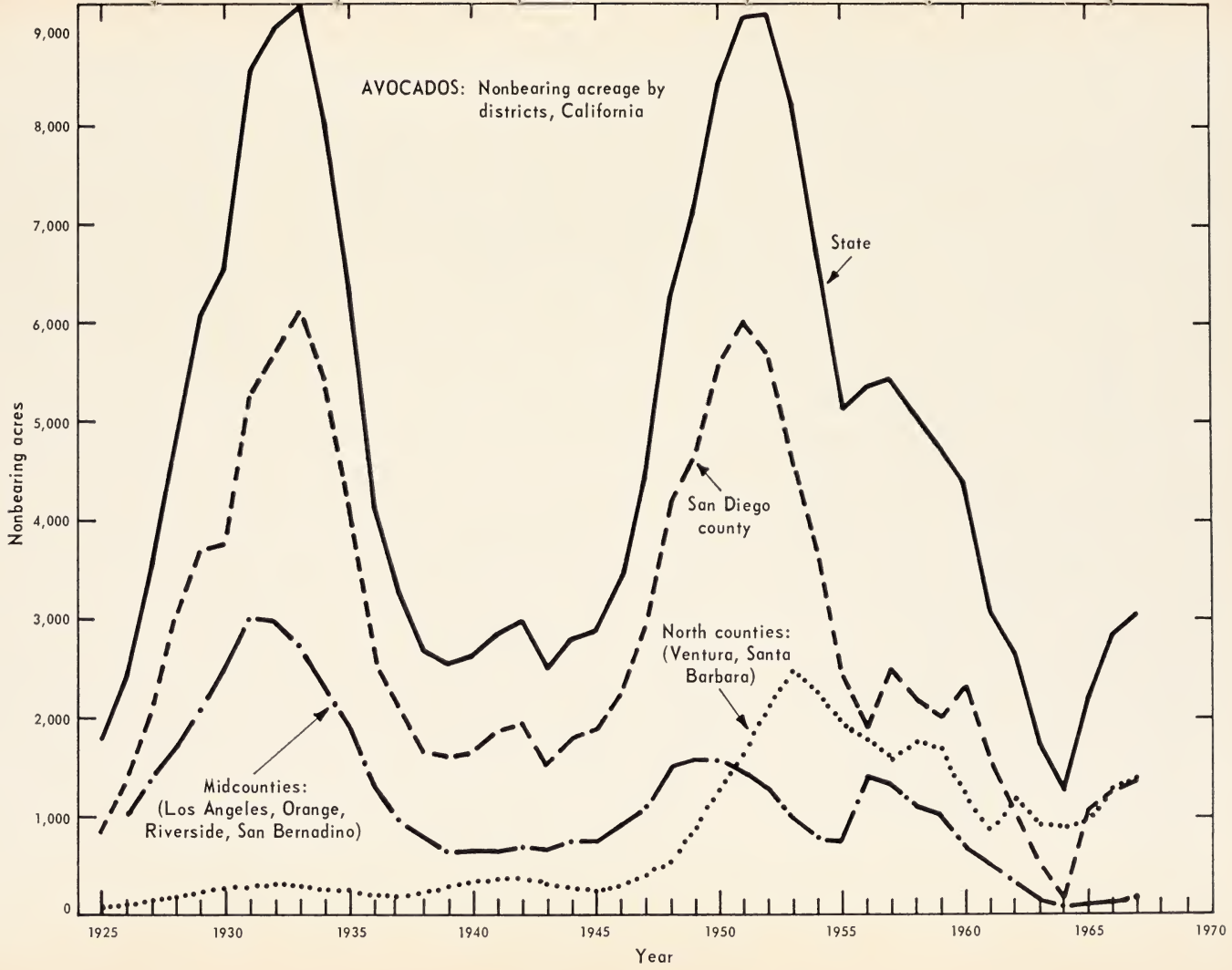
Varietal characteristics partly explain the change in bearing acreage in the three producing regions. Almost all of the early (1930) increase in bearing acreage occurred in San Diego and the Mid-counties. These plantings were predominantly of Fuerte, an early flowering variety which must be grown in localities with sufficient heat during blossoming to assure a crop set. In contrast, the second period of acreage increase occurred mostly in San Diego and the North counties. Introduction of the Hass variety permitted acreage expansion in areas of San Diego and the North counties where climatic conditions were unfavorable for setting Fuerte fruit. In addition, Fuerte is subject to more extreme bearing variations and this has encouraged changing to other varieties. Decrease in acreage in recent years in the Mid-counties is due to pressures of urbanization and a varietal characteristic of the Fuerte—development of a skin blemish when subjected to moderate to high levels of air pollution.

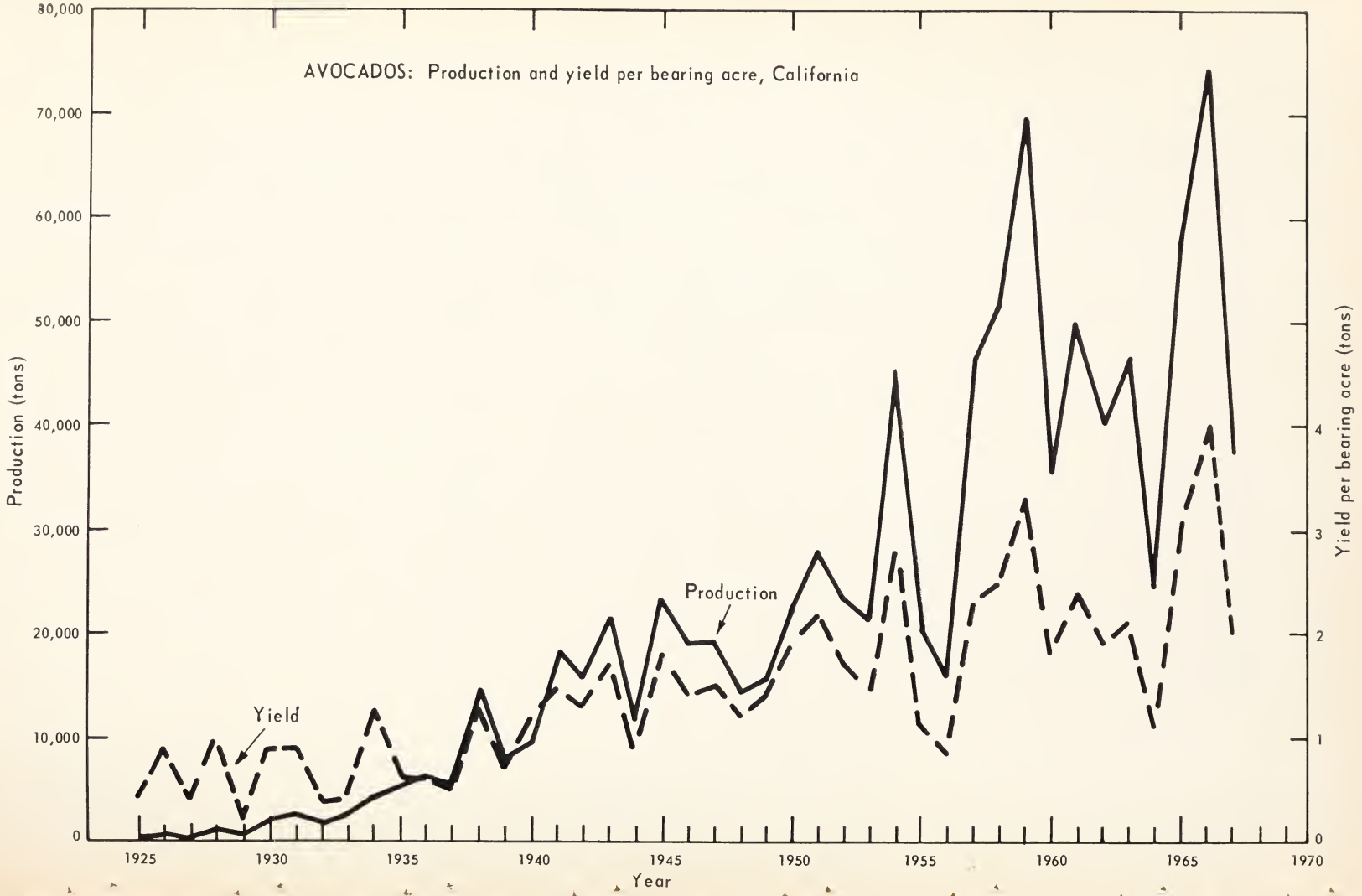
Trends in yields and total production

Yields have been increasing due to better grove management and variety selection, although high annual variations in yield occur because of the alternate bearing characteristic of avocados. Yields for 1965 and 1966 are among the highest noted for the California avocado industry and reflect favorable weather condition in those years. Low yield in 1964 was due to a combination of a severe heat wave in the early part of the crop year, and an abnormally cool spring which resulted in a light fruit set. Yield average was down again in 1967 because of a light Fuerte crop. Yields are likely to continue increasing generally as acreages in the North counties increase. Closer tree spacings in that region for high producing varieties, such as Hass, will result in higher yields per acre in the future.

Total production has closely followed per acre yield changes. Higher yields and larger bearing acreages in the recent past have accentuated the changes in production. Total production is likely to continue an upward trend in future years due to higher yields, but with an erratic year-to-year pattern because of the annual variability in yields.




AVOCADOS: Nonbearing acreage by districts, California
State
San Diego county
North counties: (Ventura, Santa Barbara)
Midcounties: (Los Angeles, Orange, Riverside, San Bernadino)
Nonbearing acres
Year
0
1,000
2,000
3,000
4,000
5,000
6,000
7,000
8,000
9,000
1925
1930
1935
1940
1945
1950
1955
1960
1965
1970


AVOCADOS: Production and yield per bearing acre, California
Production (tons)
Yield per bearing acre (tons)
Year
Production
Yield
80,000
70,000
60,000
50,000
40,000
30,000
20,000
10,000
0
4
3
2
1
0
1925
1930
1935
1940
1945
1950
1955
1960
1965
1970

OLIVES

General description of the industry

California is the only important olive-producing state in the U. S.—it supplies all the canned ripe olives consumed in the country, plus a small quantity exported to Canada and Mexico. However, over 90 per cent of the edible olive oil used in this country is imported, primarily from Spain and Italy. Thus, the long-term trend has been toward using a larger percentage (between 70 and 80 per cent in the past 5 years) for canning. Residual production is divided between crushing for oil and special products such as California Spanish green, Greek and Sicilian styles, and chopped, minced, and brined olives. As canned olives are the most important product, the quantity used in this outlet is relatively stable, with large variations in crop from year to year felt more directly in the other outlets, primarily crushing for oil. The highest quality fruit is used for canning, with smaller sizes and damaged fruits used primarily for oil.

The olive industry operates under a state marketing order which contains provisions for advertising and sales promotion, quality and size regulations, research, a proration scheme to allocate each producer a proportionate share of his production for canning olives, and stabilization plan. All olive products except inedible oils are protected by U. S. import duties, although these have been lowered in recent years.

Changes in acreage and location of production

Bearing acreage in California expanded rapidly until the late 1920's, then leveled off, and has since varied little.

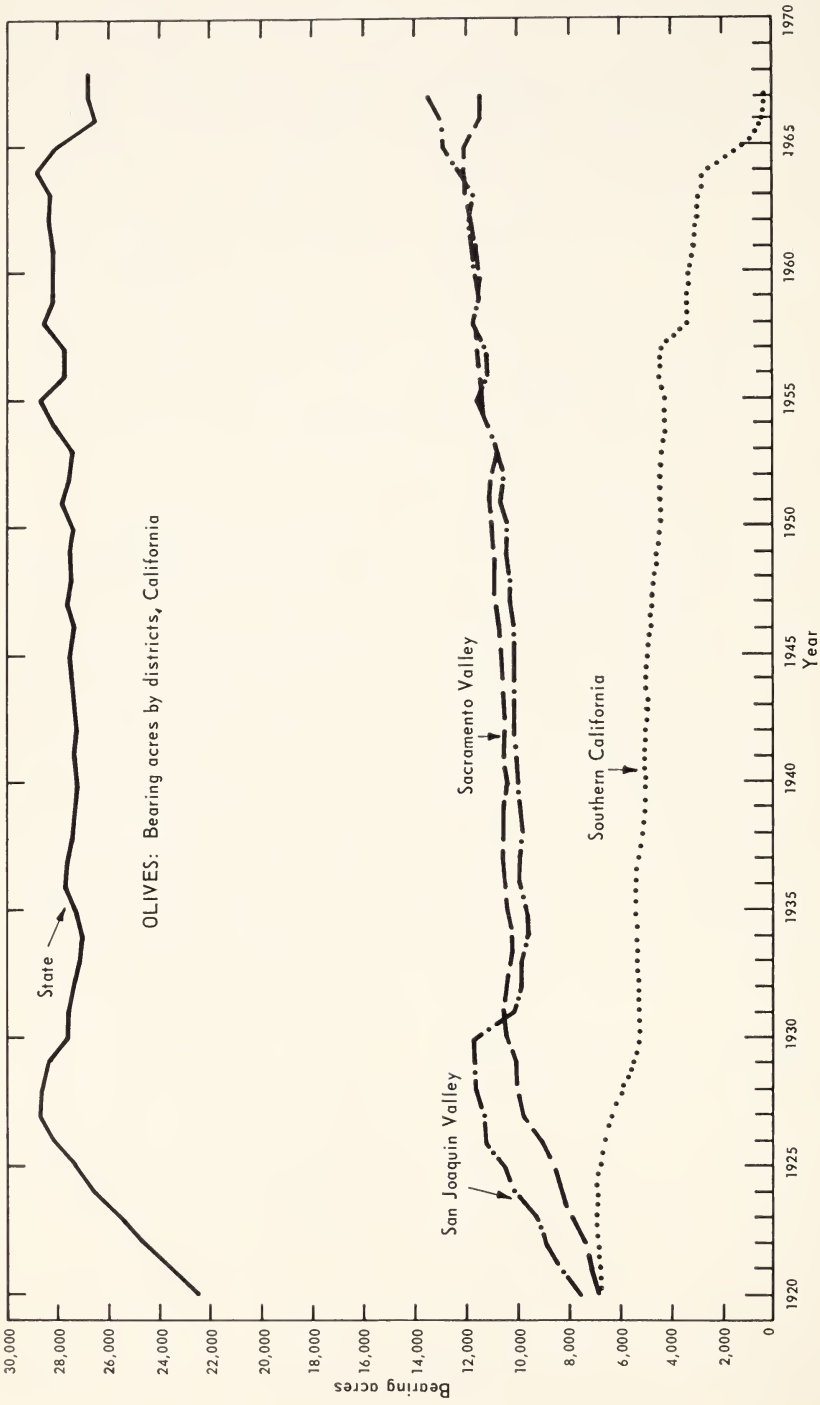
Wide fluctuations in nonbearing acreage have not been transmitted into substantial variations in bearing acreage because increased pullings have tended to offset them. Although bearing acreage has been relatively constant, the geographic composition of the acreage has changed considerably. Southern California acreage, which was important in earlier years, has essentially disappeared. Acreage has tended to become more concentrated in those parts of the Central Valley subject to winter chilling, but with hot summers free of fog. Tulare County in the San Joaquin Valley alone accounts for about one-third of the state's acreage, while Butte and Tehama in the Sacramento Valley contain another one-third. The remaining acreage is scattered widely through the Central Valley. A larger proportion of recent plantings has been in the San Joaquin Valley; hence, it will probably become the dominant production area, particularly as the trees there mature and increase in productivity.

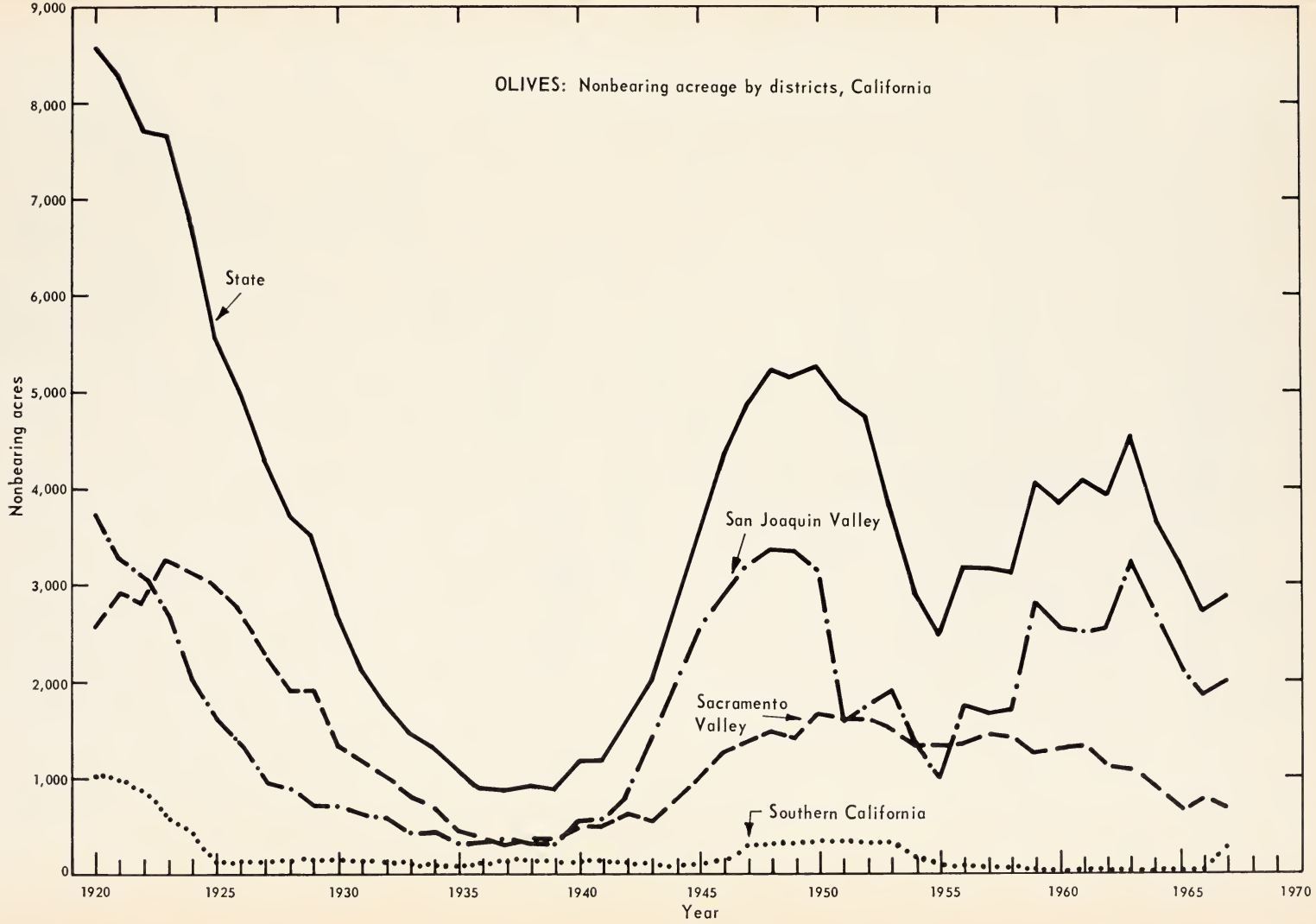
Trends in yields and total production

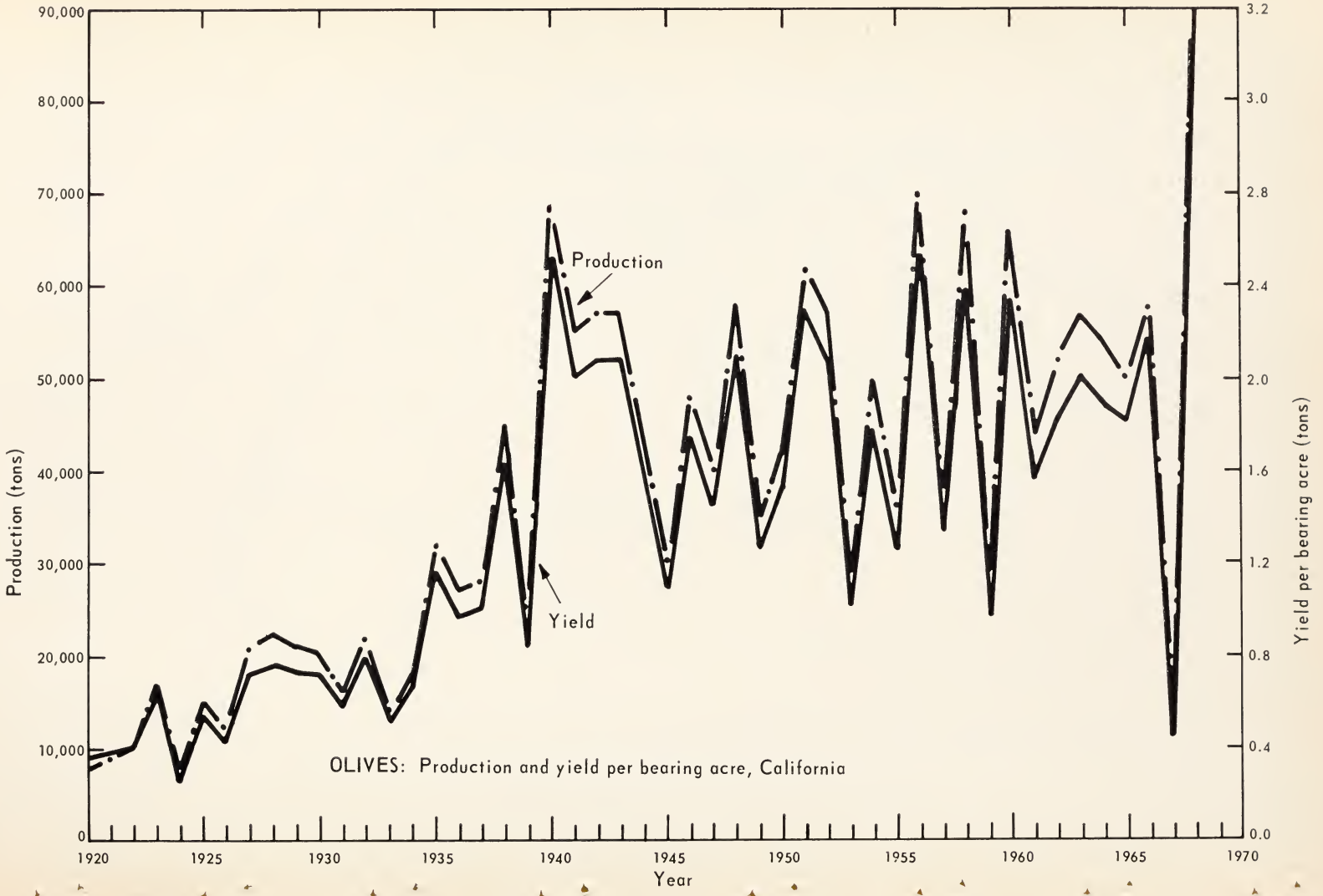
Per acre yields of olives have demonstrated a strong long-term increase, with considerable year-to-year variation due to the alternate bearing tendency of the tree (also, the trend has not been uniform). A general upward movement prevailed until the late 1930's. During the war years when olive imports were curtailed, U. S. farm prices were high, and farmers responded with increased care and more complete harvesting to sharply increase yields per acre. After the war, yields dropped but have increased again in the past few years due to changes in location toward better soils and to a change in the varietal composition of the crop toward higher yielding varieties. Still, dramatic variations in yield and production occur from year to year. The rain and cold weather at blooming time resulted in poor pollination and a light set in 1967. Favorable conditions in 1968 led to record yields and total production.

Total production has closely followed per-acre-yield changes, as bearing acreage has been relatively constant. Bearing acreage in California will probably continue to be relatively constant, judging by the

rate of new plantings in recent years. Yields are likely to continue an upward trend, although varying widely from year to year. Thus, total production will probably follow a gradual but erratic upward trend in the near future.




OLIVES: Nonbearing acreage by districts, California
Nonbearing acres
9,000
8,000
7,000
6,000
5,000
4,000
3,000
2,000
1,000
0
State
San Joaquin Valley
Sacramento Valley
Southern California
1920
1925
1930
1935
1940
1945
1950
1955
1960
1965
1970
Year


90,000
80,000
70,000
60,000
50,000
40,000
30,000
20,000
10,000
0
Production (tons)
3.2
3.0
2.8
2.4
2.0
1.6
1.2
0.8
0.4
0.0
Yield per bearing acre (tons)
Production
Yield
OLIVES: Production and yield per bearing acre, California
1920
1925
1930
1935
1940
1945
1950
1955
1960
1965
1970
Year

ALMONDS

General description of the industry

California accounts for essentially 100 per cent of U. S. almond production. Italy and Spain are also major producers, and there is a lesser production in Portugal, Morocco, and Iran.

The economic position of the almond industry in California is related to supplies of other tree nuts—walnuts, filberts, pecans, cashews, and Brazils—and to foreign production of almonds. The export market for almonds has become extremely important to California. Before 1960, the U. S. price was essentially foreign price plus transportation and tariff, but since 1962 world demand has increased and foreign prices have become almost equal to those in the United States. Thus, California has disposed of around 15 to 20 per cent of its crop in foreign markets at favorable prices in recent years, while imports have been negligible. The California almond industry is under a marketing order which designates a certain percentage (about 85 per cent usually) as salable domestically and 15 percent as surplus which must be disposed of in noncompetitive domestic uses or in foreign markets, but this percentage in exports has been exceeded recently due to favorable foreign prices. Marketing of California almonds is quite centralized, with a cooperative handling 75 per cent of the crop. Most of the California crop is shelled and sold to confectioners, salters, bakeries, and ice cream manufacturers. Only about 10 per cent of the crop is retailed directly.

Changes in acreage and location of production

Changes in nonbearing and bearing acreages of almonds are not easily explained by past general economic conditions. In fact, trends in nonbearing acreage have often run counter to conditions in the national economy. Nonbearing acreage declined in the 1920's though prices were generally favorable. Plantings and nonbearing acreage increased substantially during the depression. Nonbearing acreage declined again during World War II, despite generally high prices. This unusual relationship may be partly explained by observing that almond prices relative to prices of other agricultural commodities are probably more significant than the absolute level of almond prices in determining new plantings. Thus, during periods of falling prices, growers apparently shifted from higher-risk crops to almonds. During periods of higher prices, growers apparently shifted away from almonds toward walnuts and other crops. Another explanation may be in the nature of the crop, which is relatively easy to grow and prospers under somewhat adverse soil and other conditions.

After World War II, acreage has responded more normally to economic conditions. New plantings after the war dropped off because of low prices, although there has been a dramatic boom in new acreage since 1955—this appears to be in response to more favorable prices, ease of mechanization in the face of labor problems (almonds are now practically 100 per cent mechanically harvested), and, to some degree, the entry of nonagricultural speculators interested in investments under favorable tax regulations. Thus, bearing acreage has increased markedly since about 1960, and will undoubtedly continue to increase substantially as the big buildup in nonbearing acreage comes into bearing.

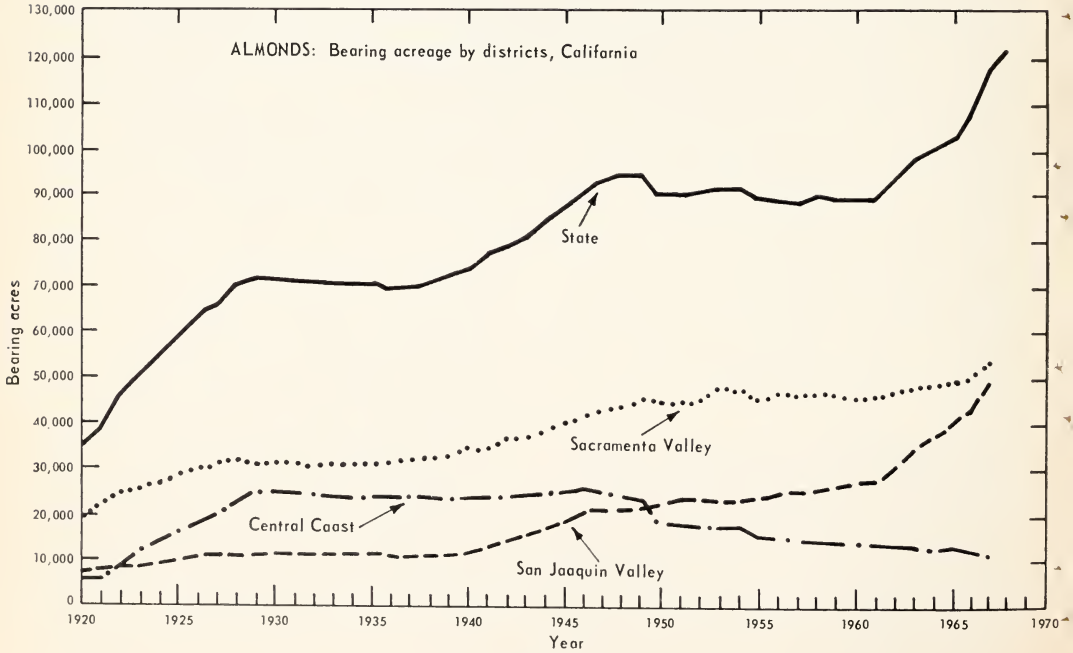
The bearing acreage of almonds in the Central Coast (mainly the Brentwood district of Contra Costa County and the Paso Robles district of San Luis Obispo County) has declined in recent years. At the same time, bearing acreages have steadily increased in the Sacramento Valley (largely in Butte, Yolo, Colusa, Sutter, and Glenn

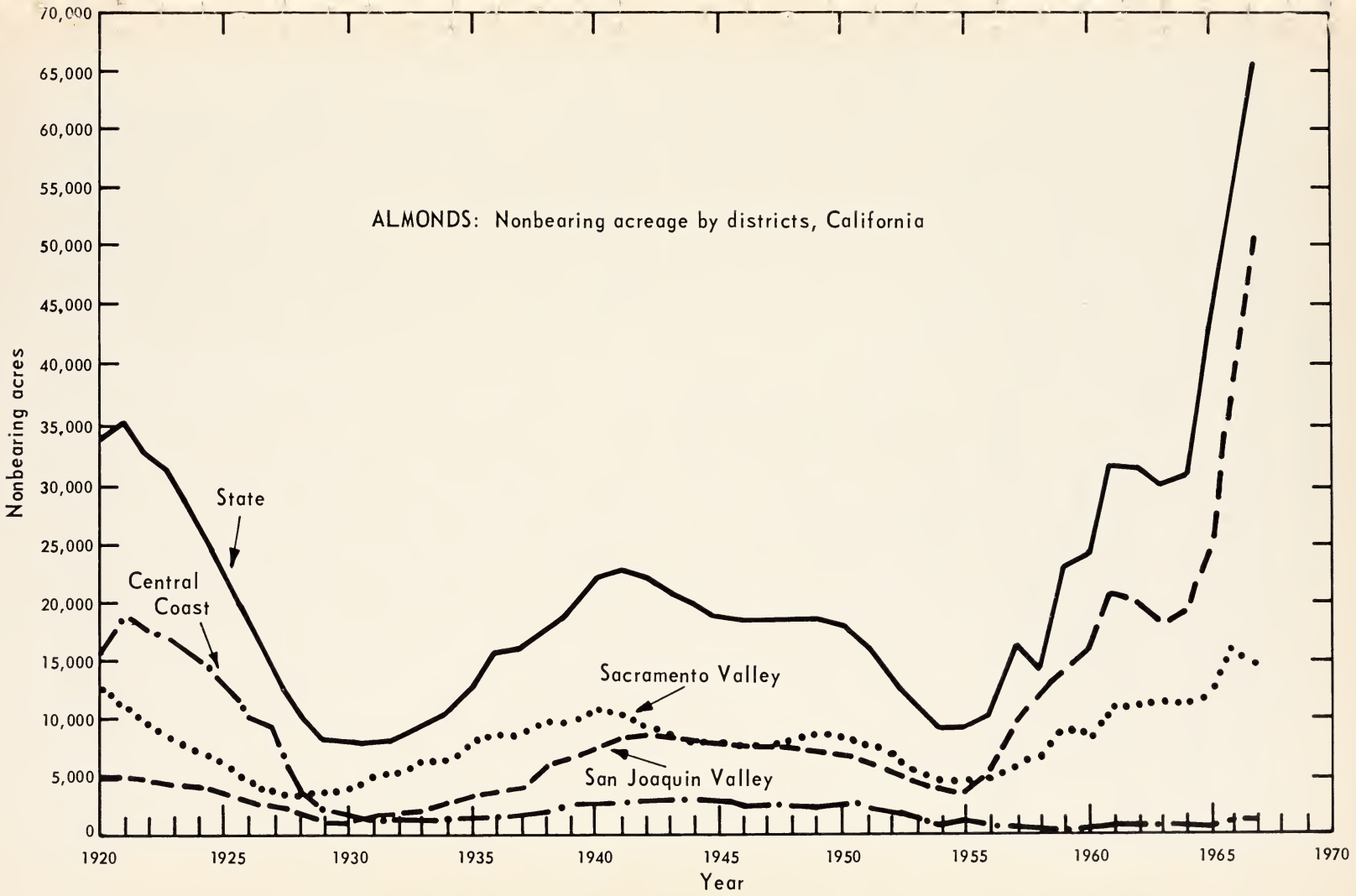
counties), in the northern San Joaquin Valley (mainly in Stanislaus, Merced, and San Joaquin counties), and in Kern County. The nonbearing acreage in Merced County alone jumped by 7,000 acres from 1966 to 1967, while the nonbearing acreage in Kern County increased by 3,000 acres in the same period. The shift, which can be explained mainly by higher yields in the interior valleys is far from complete, as clearly shown by a steady decline in nonbearing acreage in the Central Coast area. Some of the new acreage is being planted on what might be less productive soils. However, some plantings are also on good orchard soils.

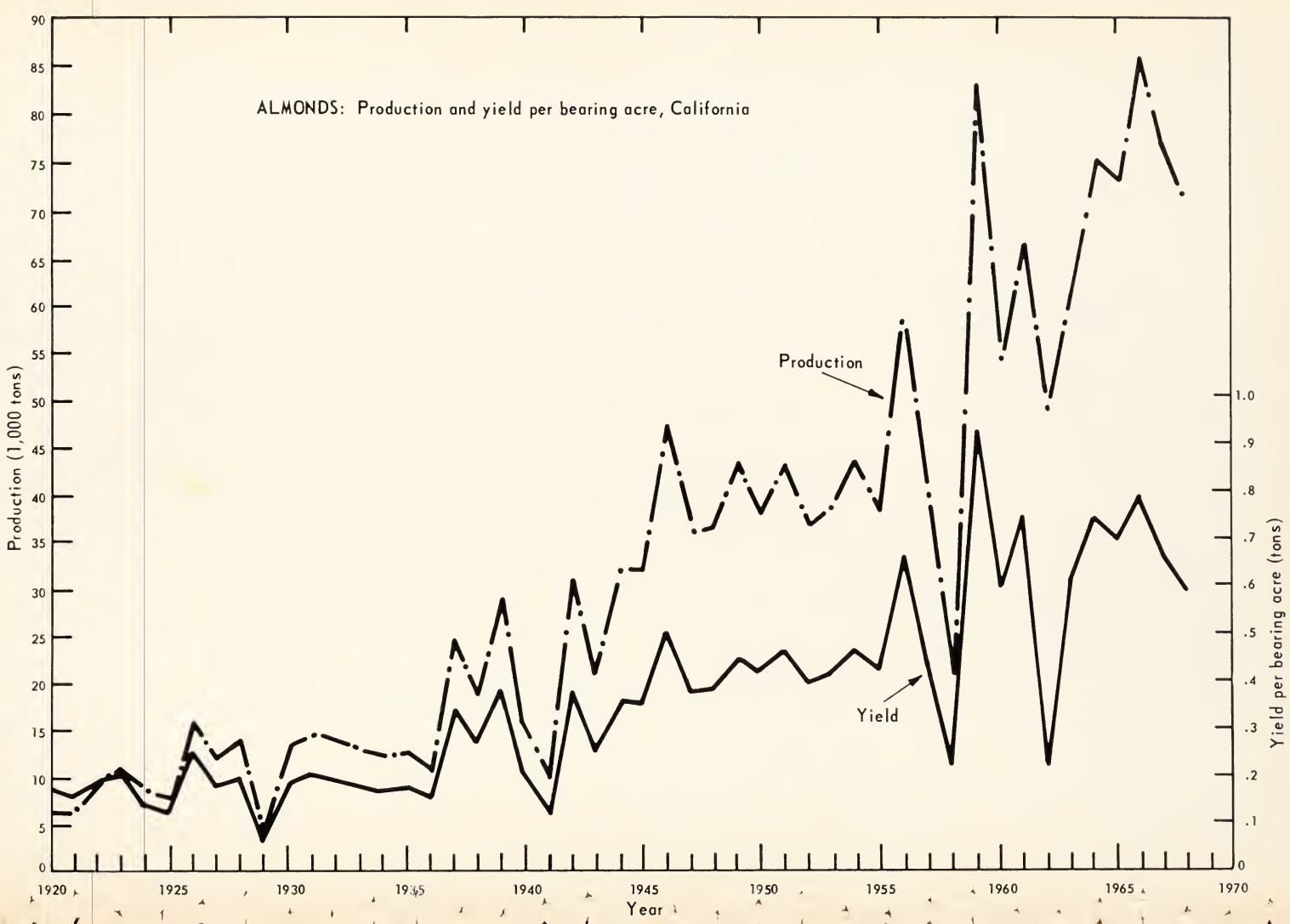
Trends in yields and production

Yields of almonds in California have increased since the late 1930's, reaching a record peak in 1959. The trend toward higher yields has been interrupted with disastrously low yields in 1958 and 1962 due to bad weather. General uptrend in yields has resulted from several factors: (1) better cultural practices, including more and better fertilizers and pesticides, better pruning, increased protection against frost, better spacing of trees, providing pollinating varieties and more bees, and other practices; (2) favorable climate in almond-growing areas; and (3) a shift of acreage to the interior Sacramento and San Joaquin valleys, where better soils and irrigation and improved varieties provide opportunities for higher yields. The outlook is for further yield increases as older, low-producing coastal orchards are replaced by higher-yielding orchards in the Central Valley.

Because of yield and acreage increases, total almond production in California has increased sevenfold since the twenties. With bearing acreage sure to increase in the near future, and with yields increasing, prospects are for a continuation and perhaps acceleration of the strong uptrend in total production. Excess supplies may become an industry problem in the future, depending on how the world demand-supply situation affects the California export market. For this and other reasons, expanded markets are being sought by the industry.




ALMONDS: Nonbearing acreage by districts, California
Nonbearing acres
70,000
65,000
60,000
55,000
50,000
45,000
40,000
35,000
30,000
25,000
20,000
15,000
10,000
5,000
0
State
Central Coast
Sacramento Valley
San Joaquin Valley
1920
1925
1930
1935
1940
1945
1950
1955
1960
1965
1970
Year


ALMONDS: Production and yield per bearing acre, California
Production
Yield
Production (1,000 tons)
Yield per bearing acre (tons)
Year
0
5
10
15
20
25
30
35
40
45
50
55
60
65
70
75
80
85
90
.1
.2
.3
.4
.5
.6
.7
.8
.9
1.0
1920
1925
1930
1935
1940
1945
1950
1955
1960
1965
1970

WALNUTS

General description of the industry

In terms of average tonnage produced, walnuts rank second only to pecans as the major tree-nut crop grown in the U.S. Pecan production, however, fluctuates widely from year to year since a large proportion of the pecans comes from wild or seedling trees. Almonds rank closely behind walnuts as the other major tree-nut crop.

Commercial walnut production in this country is confined to the Pacific Coast (California, Oregon, and Washington); California dominates with about 95 per cent of U.S. production. As the California walnut industry expanded it increased its share of world production through the early 1950's to about 55 per cent, compared with only 30 per cent 20 years earlier. However, in the past 10 years walnut production has expanded more rapidly in other countries (primarily France and Italy), reducing the U.S. share of the world supply to about 45 per cent.

U. S. imports of walnuts have been closely and inversely correlated with the growth of the domestic industry. As the industry has developed—adopting quality standards, uniformity, and brand names—imported walnuts, particularly in-shell, have been replaced by the domestic product. However, the United States still imports 10 to 20 per cent of its annual shelled consumption (mainly from Turkey, Iran, and India, in recent years). Tariffs on imported walnuts run about 20 to 30 per cent of import prices. U. S. exports of walnuts are small, accounting for only 2 to 3 per cent of domestic production.

Concentration of U.S. production in California allows the industry to be highly organized; a high percentage of California's production is processed and marketed by a single grower-owned cooperative marketing association. Important changes have taken place in utilization of the crop. Currently, 55 to 60 per cent of the crop is shelled—a significant increase over earlier years. In addition, about half of the shelled walnuts are sold for direct household consumption, representing a sharp increase from around 15 per cent of the shelled crop sold direct prior to World War II.

Changes in acreage and location of production

As with most tree crops, the annual supply of walnuts is little affected by current economic forces (though they influence new plantings and thus affect supplies later). A steady expansion in bearing acreage through the 1930's reflects a high rate of new plantings in the 1920's when prices were favorable. Depression prices during the 1930's discouraged new plantings. The resulting decrease in nonbearing acreage was halted only after another high price period during World War II. Total bearing acreage declined somewhat after the war, mainly because of the rapid rate of removals in southern California. However, more favorable prices and easy mechanization stimulated a sharp rise of new plantings in the late 1950's; this has been translated into a steady increase in bearing acreage since about 1955.

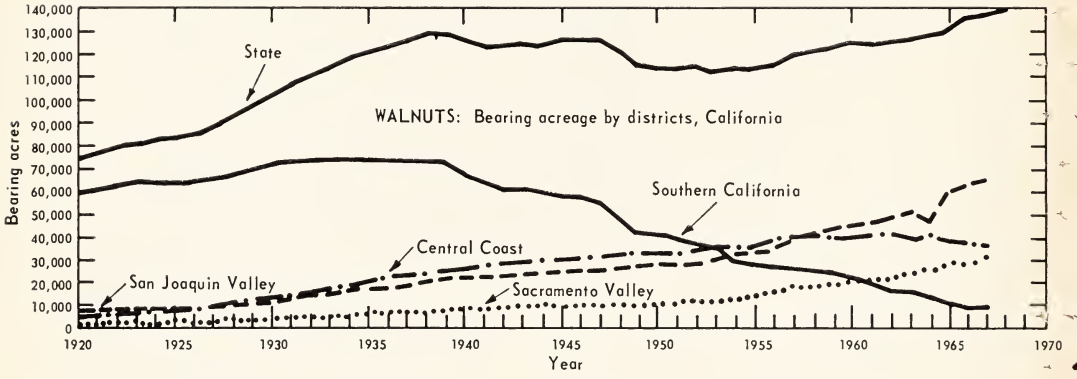
The decline of bearing acreage in southern California has been striking. This acreage is in three principal districts: Pomona, Ventura-Santa Paula-Moorpark, and Santa Barbara-Goleta. The rapid rate of tree removals in southern California has resulted from suburban development, high production costs, competition from more profitable alternative crops, and pest infestations. Acreages increased substantially in the Central Coast area (Santa Clara Valley, central Contra Costa County, and Lake County) until about 1957 but have stabilized or declined slightly since. Major increase in new acreage has been in the Central Valley. The largest absolute growth has been in the San Joaquin Valley (around Linden, Modesto, and Visalia). However, recent growth in the Sacramento Valley has also been large and spread widely, including the Yuba City-Marysville area, and the Colusa, Chico, and Corning areas. The shift to the interior

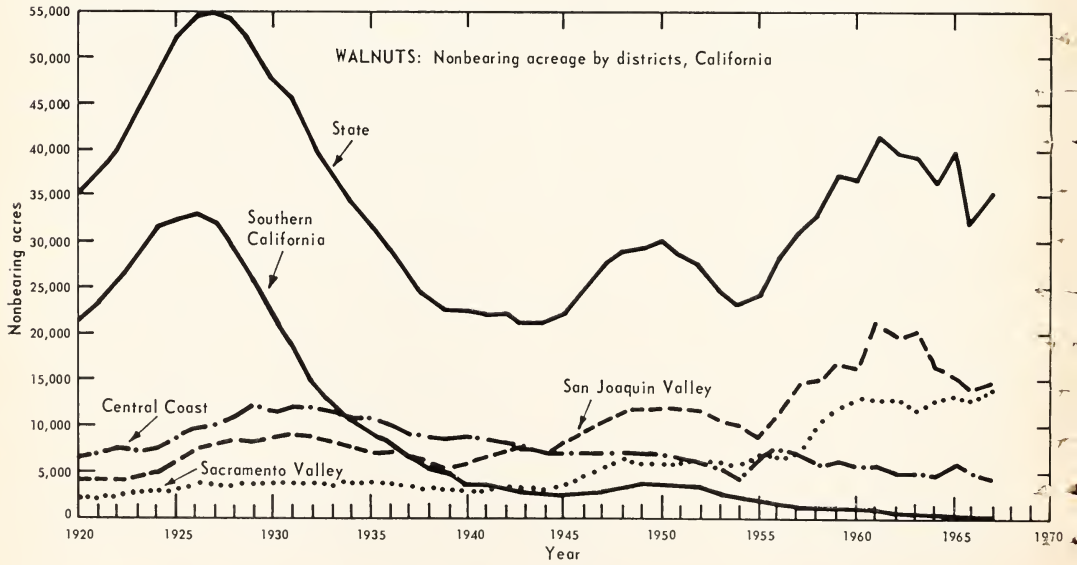
valleys has been encouraged by higher potential yields as well as by urbanization in southern California and the Central Coast area.

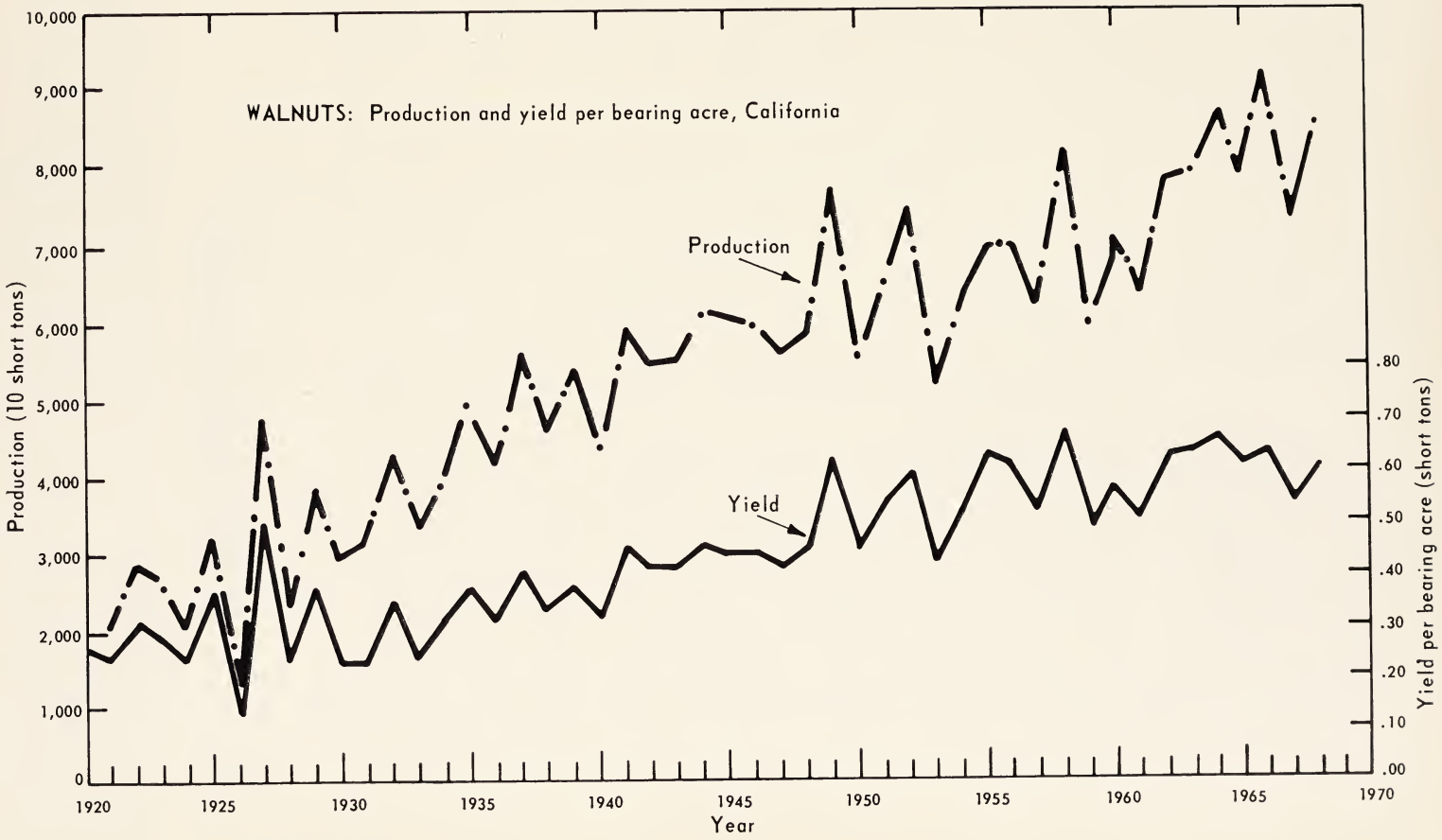
Trends in yields and production

Yields of walnuts have been quite irregular from year to year, but have followed a general upward trend since the late 1930's. Closer planting of trees of higher-producing varieties, improved irrigation and insect control, and better pruning practices are some of the factors responsible for the general uptrend. Age of walnut groves is also an important factor in yields, since the productive capacity of walnut trees increases greatly with size. Therefore, yields per acre may increase at a faster rate in the near future as higher-yielding recent plantings in northern California mature.

Total production of walnuts in California increased sharply until World War II, with both acreage and yield increasing. Until about 1955, increased yields about offset acreage declines, but since then average production has again increased. With the high level of new plantings and continuation of high yields, the walnut industry has a production potential which could result in a substantial increase in the average level of production in the next several years.






WALNUTS: Production and yield per bearing acre, California
Production
Yield
Production (10 short tons)
Yield per bearing acre (short tons)
Year
10,000
9,000
8,000
7,000
6,000
5,000
4,000
3,000
2,000
1,000
0
.80
.70
.60
.50
.40
.30
.20
.10
.00
1920
1925
1930
1935
1940
1945
1950
1955
1960
1965
1970

Commercial vegetable production in California has diversity and high economic value resulting from favorable production and marketing seasons, irrigation, and specialized management in agriculture. California's acreage of principal vegetable crops amounts to less than 20 per cent of the U.S. harvested acreage, but the value of production is near 35 per cent of the value of U.S. production.

Cash receipts from vegetable crops amount to more than one-fourth of the value of all crops produced in the state. California ranks first nationally in the production of such major vegetable crops as asparagus, lima beans, broccoli, Brussels sprouts, carrots, cauliflower, celery, garlic, lettuce, cantaloupes and honeydew melons, spinach, and tomatoes. The majority of California's aggregate production (70 to 75 per cent) is utilized in the fresh form. The state's increasing population provides an ever-growing local market, but a large share of the produce is moved through national and world markets. Climatic characteristics favor California production at times of the year when production is less feasible in other areas of the nation, and shipments to other regions are substantial when those areas are seasonally out of production.

Some of the following discussion will treat the seasonal production of certain vegetable crops as if they were individual commodities. In a sense they are, for both location of production and competition in markets vary in the different seasons. The seasons, classified by periods of active harvest, are identified in the vegetable industry as follows:

Seasonal designation (approximate)	*Harvest period*
Winter	Jan. 1 to Mar. 31
Early spring	April 1 to May 15
Late spring	May 16 to June 30
Early summer	July 1 to Aug. 15
Late summer	Aug. 16 to Sept. 30
Early fall	Oct. 1 to Nov. 15
Late fall	Nov. 16 to Dec. 31

California's share of the processed vegetable market, although of minor importance compared with the fresh market, is nonetheless significant on the national level. This share has increased in recent years, and California's output now represents about one-third of the national processed vegetable market. Primary factors for this increase are associated with growth in the processed tomato industry and in production increases of green vegetables for freezing. The processing sector of the vegetable industry displays more year-to-year variability in value than the fresh market, which is typical of commodities having fresh *and* processed markets.

For purposes of describing vegetable production in southern California, seasonality in production results in two subregions having distinct and different harvest seasons: the Southern Desert (San Bernardino, Riverside, and Imperial), and Southern Coast (Santa Barbara, Ventura, Los Angeles, Orange, and San Diego). Differences in seasonality of vegetable production among these subregions of southern California are important because of significant variation in climatic conditions between coastal and inland areas.

ASPARAGUS

General description of the industry

California accounts for nearly one-half of U.S. asparagus production. All asparagus production in California is classified as *early spring,* with harvest usually extending from March 15 to May 15. Competition comes from the *mid-spring* crop in Washington and Oregon (April 15 to June 15)

CALIFORNIA'S MAJOR FRESH MARKET VEGETABLE, MELON AND POTATO PRODUCING DISTRICTS

Source: California Crop ond Livestock Reporting Service

and the eastern *late spring* crop dominated by New Jersey and, to a lesser extent, by Michigan and Illinois (May 1 to late June).

Asparagus has both fresh and processed markets. The first fresh asparagus is harvested in late January or early February. Fresh market prices follow a pattern of opening at fairly high prices and then declining gradually as supplies increase. Most of California's fresh market shipments are made early in the season before the eastern crop comes into the market, although the San Francisco and Los Angeles markets take quantities of fresh asparagus throughout the season.

Generally, about 70 per cent of the California crop is processed, four-fifths of the crop is canned, and one-fifth frozen. Processor demands tend to provide a floor for fresh prices and supplies are diverted to processors when fresh prices fall. The disposition of the short crop in 1965 differs sharply from general trends and gives an example of the residual nature of the processing outlet—only 59 per cent was processed because of high fresh-market prices.

California produces all of the white asparagus canned in the U.S. The recent composition of the canned pack of asparagus reflects stronger demand for the green than for the white product. Whereas 90 per cent of the 1930 canned pack was white, in recent years white has been only about 60 per cent, and there is much uncertainty about the future of the white asparagus industry—its survival, in fact, may depend on development of mechanized harvest equipment. Foreign competition (Taiwan and, more recently, Peru) has reduced California's exports of canned white asparagus to important European markets and, in particular, to West Germany.

Changes in acreage and location of production

The Delta district, the major asparagus-producing area of the state, lies partly in the San Joaquin Valley (San Joaquin County), in the Sacramento Valley (Sacramento, Yolo, and Solano counties), and the Central Coast (Contra Costa County) crop-reporting districts. In the 1950's, the Delta had over 95 per cent of California's harvested acreage. Within the Delta, a shift from the Sacramento Valley to the San Joaquin Valley occurred prior to 1950. In 1935, three-fourths of Delta acreage was located in the Sacramento Valley, whereas by 1950, over 80 per cent of Delta acreage was to be found in the San Joaquin Valley. The major reason for this shift was *Fusarium* wilt in asparagus-producing areas of the Sacramento Valley. It has not been profitable to replant asparagus on afflicted lands even after many years, although wilt-resistant varieties appear in the offing. Hence, asparagus acreage has moved south to "clean" soils in the Delta area. San Joaquin County alone now contributes two-thirds of California's harvested acreage.

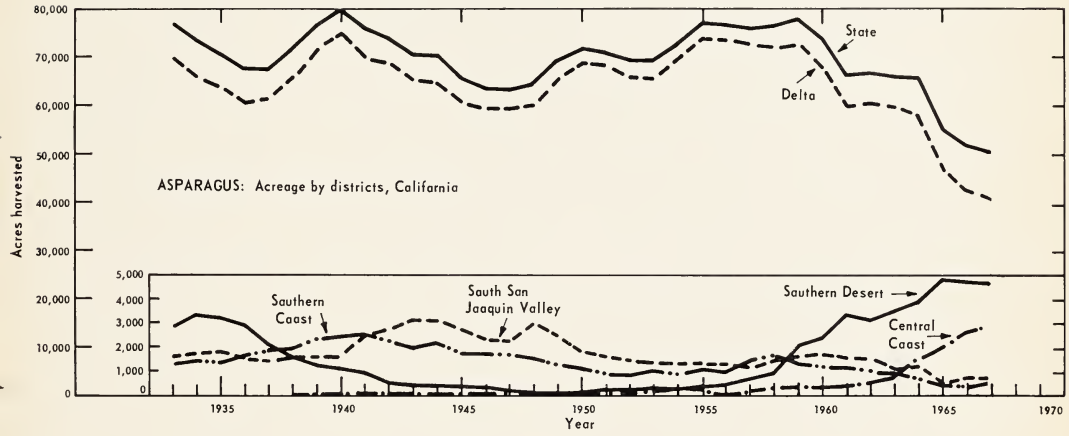
State acreage has fallen sharply from the recent high of almost 78,000 acres in 1958 to 50,000 acres in 1967. The sharp decline is attributed to labor shortages, most of which has occurred in the Delta where acreages fell by more than 40 per cent from 1959 to 1967. Most of the acreage removed consisted of old and marginal beds, and bearing acreage is likely to level off for the next several years.

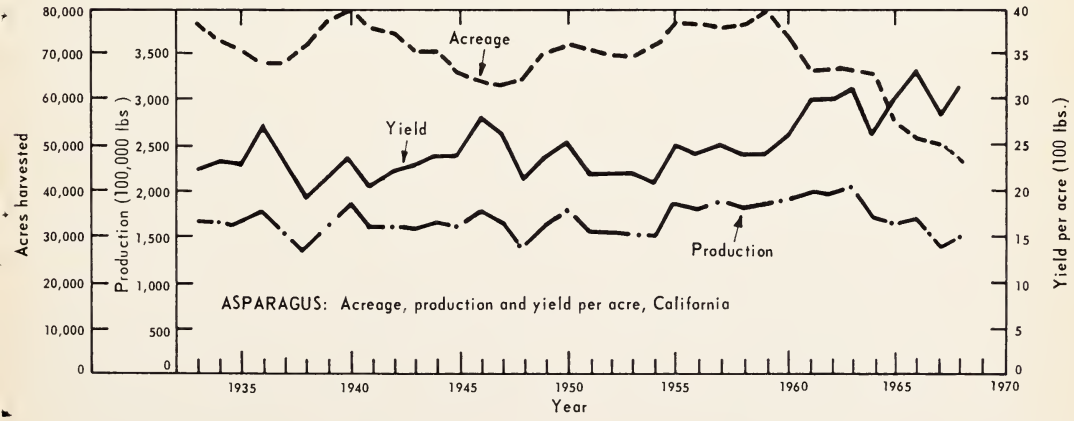
Expansion in acreage has been encouraged in the Southern Desert (Coachella and Imperial valleys) by premium prices on the early fresh market. Recent acreage increases are also noted in the Salinas Valley. A major shift in location of southern San Joaquin Valley production occurred with the virtual exodus of asparagus production from Tulare County (over 1,400 acres in 1960) to new plantings in Kern County. Asparagus acreage may well shift considerably in the future as the search continues for new disease-free soils well suited to asparagus production.

Trends in yields and production

There was no general increase in asparagus yields from 1933 to 1959, but higher-than-average yields occurred in 1936 and in 1946–47 when some lower-yielding beds were removed from production. The lack of a general trend was due to geographic shifts within the Delta, but the move to less-productive soils has been roughly off-

set by improved cultural practices. Peat soils of the Delta area produce lower yields than the peat sediment soils of former asparagus-producing centers; asparagus beds were also longer lived on the sediment soils. Higher water tables and slow subsidence in the Delta area have also hampered production. Sharp decreases in acreage since 1959 resulted from removal of old and marginal beds with widely spaced plantings. Because a higher percentage of the remaining acreage now consists of narrower plantings, and of better fields at or near their peak bearing age, average yields have increased to record levels. However, a shift toward mechanized harvesting to offset labor shortages could result in reduced yields (although these reductions may in part be offset by higher plant populations). Harvesters have not performed well in sediment soils, so the development of *Fusarium* wilt-resistant varieties is important to stabilize acreage on peat soils. New varieties have been developed but their degree of resistance is uncertain. Relatively stable production has resulted from the offsetting changes in acreage and yield when they occurred.





GREEN LIMA BEANS

General description of the industry

California produces about 45 per cent of the green lima beans grown for processing in the U.S., making it the nation's foremost producer, and about 95 per cent of the production is used in the frozen foods industry. In California, green lima beans are harvested from mid-August through October and they are often grown as a second crop following early vegetable production. Thus, they are complementary to food freezers processing other vegetable crops—for example, limas follow broccoli in the cropping pattern common in the Santa Maria Valley. The importance of the freezing industry is particularly evident in the postwar (1945–1948) growth of lima production, when harvested acreage increased sharply from 4,000 to 22,000 acres in California. Nationally, per capita consumption of frozen lima beans rose steadily from .2 pounds to nearly .75 pounds by 1953. Per capita consumption then stabilized, but increasing population has added steadily to demand through the present time.

Both large (Fordhooks) and baby limas are produced, with minor production of Emerald, an intermediate-sized bean. California's acreage of large limas for freezing is about three-fourths of the U.S. total, while baby lima acreages in the state have ranged from one-fourth to one-third of the U.S. acreage for freezing.

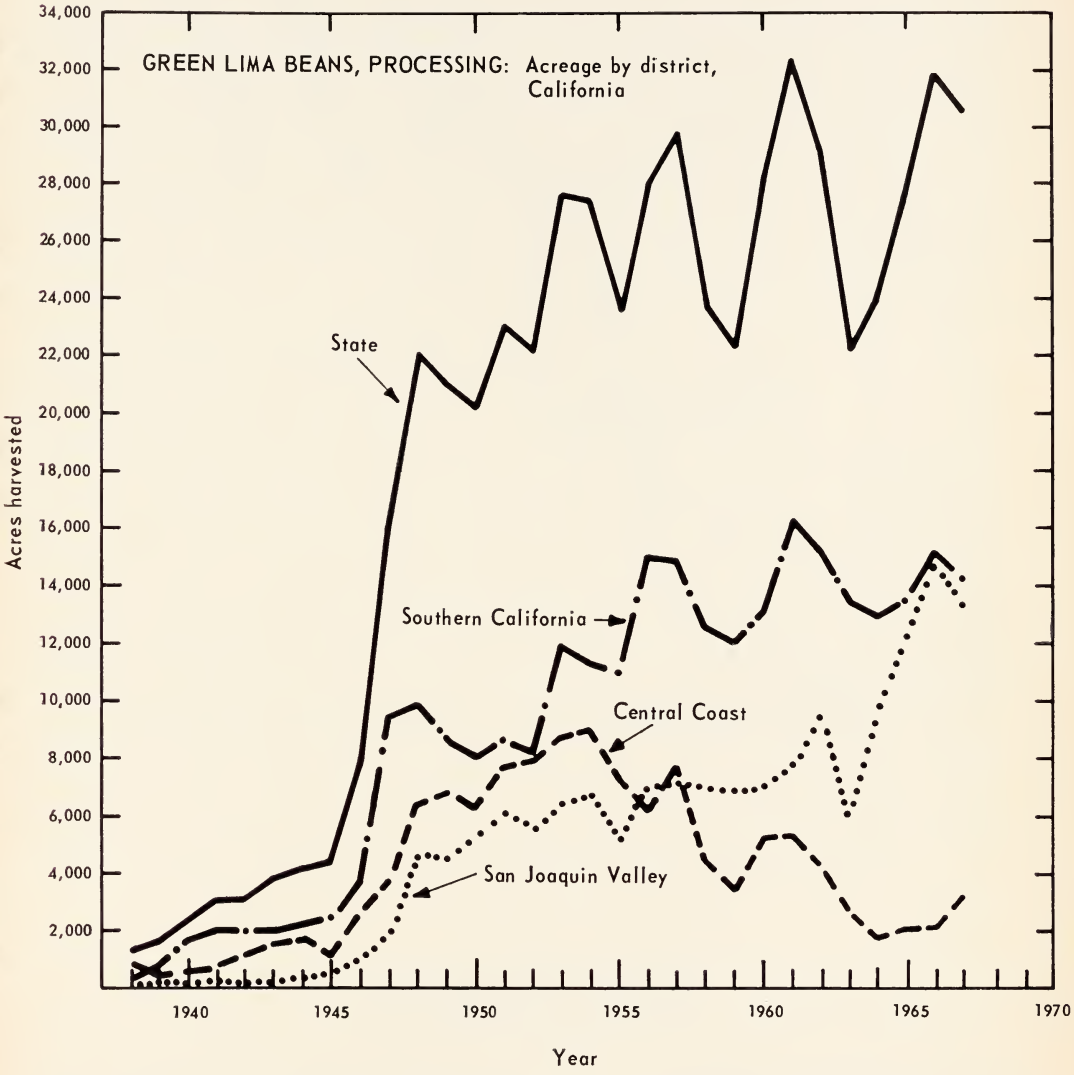
Changes in acreage and location of production

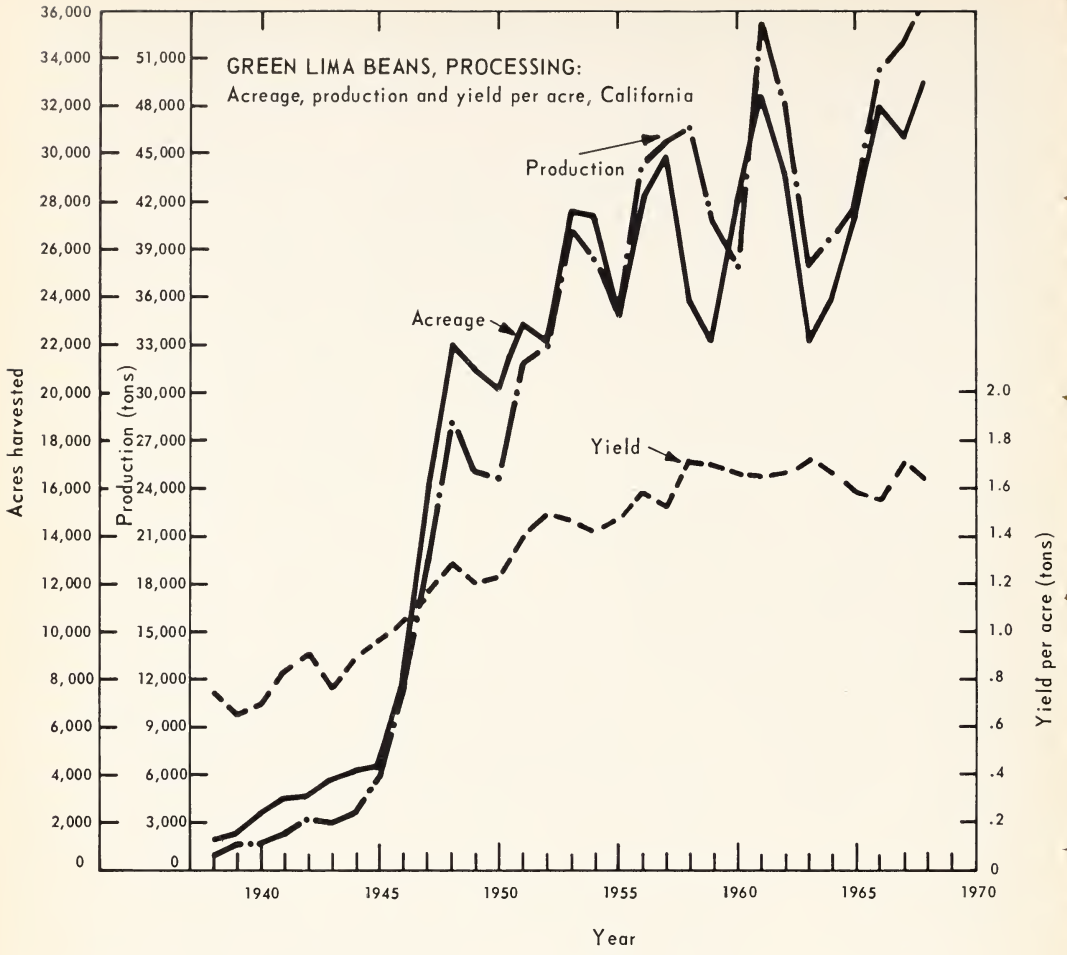
Total acreage has increased but with great annual variability after the rapid postwar growth of the industry. Part of the variability is due to annual planting decisions based on price expectations for other fresh and processing vegetables and for dry lima beans, which compete for acreage with limas intended for freezing. Production is located in both coastal and interior counties. Large limas are produced in the southern California and the Central Coast districts. Ventura County dominates production and accounts for more than half of acreage and total production of large limas. Monterey (King City) and Santa Barbara (Santa Maria) are other major producing areas. Initially, Santa Clara (San Jose area) was a major production area but urbanization reduced acreage from nearly 6,000 acres in 1954 to 2,000 in 1958 and by the mid-1960's to less than 500 acres. This change underlies the downward trend in acreage noted for the Central Coast from 1954 to 1964. Urbanization has also affected acreage in southern California. Orange County, initially a major production area, lost considerable acreage from 1956 through 1959 (and still more recently), but increases in Santa Barbara (and Ventura) have been offsetting—in fact, southern California acreage continues to increase. Baby lima production has always been concentrated in Stanislaus County with additional San Joaquin Valley acreage noted in Merced County. The sharp acreage decline in 1963, and the subsequent increase, resulted from acreage changes in Stanislaus. From 1963 to 1966, acreage in that county increased from about 4,500 to over 11,000 acres in response to extremely favorable marketing situations for baby limas for freezing.

Trends in yields and production

Yields increased regularly through the early years of the green lima bean industry in California as growers became acquainted with production and improved cultural and management practices. Varietal improvements and changes in location of production continued the upward trend through the late 1950's. Fordhook production is now universally based on using the Concentrated Fordhook, an improved variety. The shift of acreage from Orange County was to areas with higher production potential. Stable yields since 1958 reflect the widespread adoption of Concentrated Fordhook and Thorogreen (baby) lima varieties. The only other variety of

some significance is Emerald, which was planted to minor acreages in King City and in interior counties. Because of the early gradual increase and later rather stable yields per acre, variability in total production has been closely correlated with fluctuations in acreage, particularly in the past two decades.





BROCCOLI

General description of the industry

California produces 95 per cent of all broccoli consumed in the United States, and about 70 per cent of the total U. S. frozen pack is processed in California. The development of a large processing industry has paralleled a threefold increase in per capita consumption of the frozen product since 1950. In 1950, per capita consumption was approximately four-fifths fresh and one-fifth frozen, but the shift to the frozen product has been such that national figures now show per capita consumption of about two-thirds frozen and one-third fresh. (California also ships much fresh broccoli to Canada.)

California has virtually year-round production of broccoli. The *early spring* crop is harvested from about December 20 to June 30, with the most active period of

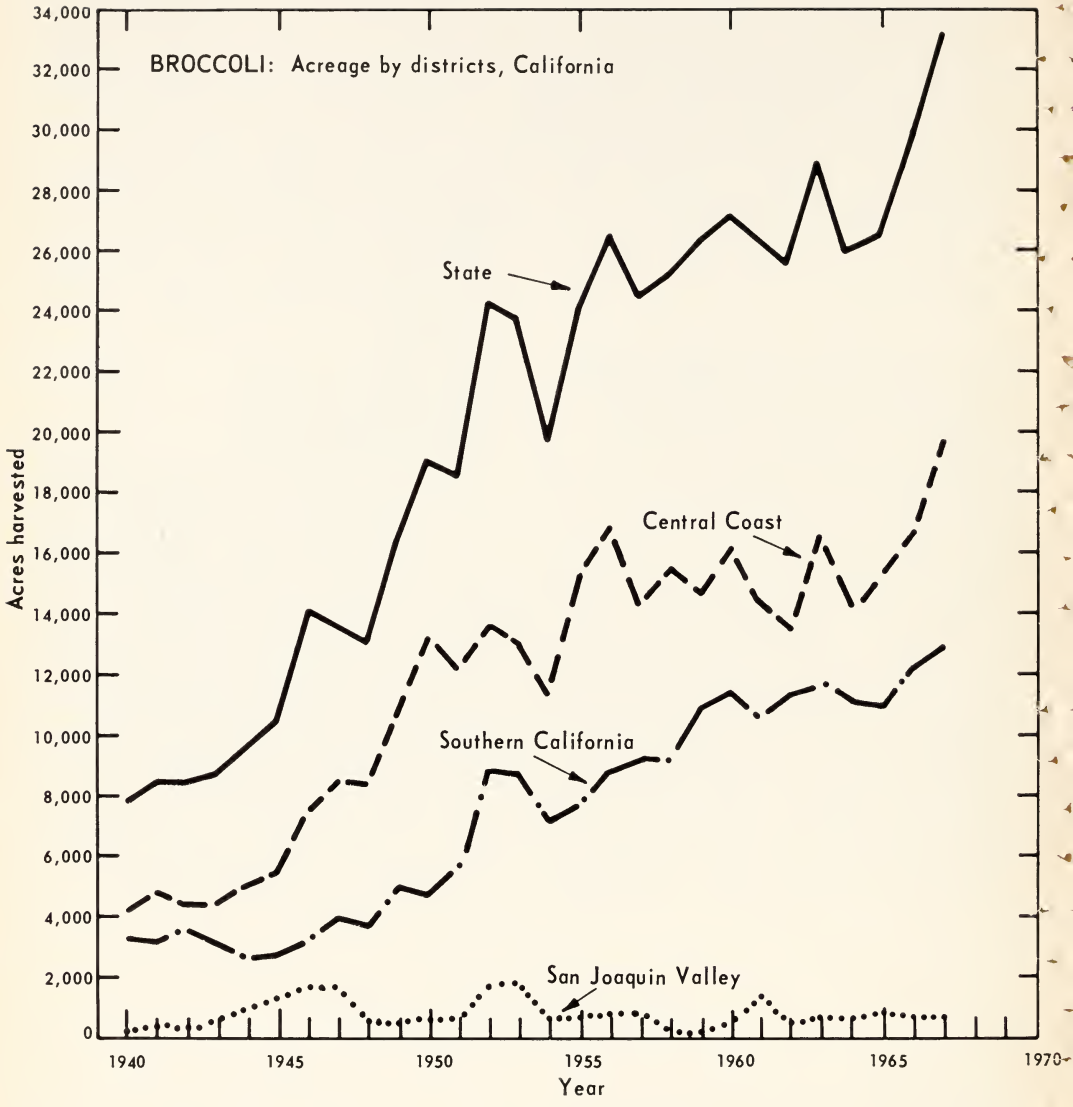
harvest occurring in February and March. The *fall* season normally extends from July 10 to January 31, with the most active harvest from October through December. Unlike seasonal production for most crops, the major broccoli-producing areas of the southern and central coasts provide important quantities in both seasons. California is the sole producer of *early spring* broccoli, although relatively small quantities of the *late spring* crop from New Jersey competes in the eastern fresh market during June. California's production accounts for about two-thirds of the *fall* crop nationally; the other major production areas are Oregon, New York, New Jersey, and Washington.

Changes in acreage and location of production

Total acreage devoted to broccoli production has increased because of processing demands. Year-round production is possible in certain areas of the state—in the Santa Maria Valley, for example, freezer plants can generally process broccoli in all but one month. Total acreage now appears to be leveling off after a steady increase from 1940 to 1952 which saw acreage triple from 8,000 to 24,000 acres. Except for early production in the Imperial Valley, broccoli is produced in the cool climates of the southern and central coasts. The two major production areas are the Santa Maria Valley (Santa Barbara County) and the Salinas-Watsonville district (Monterey County). In 1965, of the total state acreage (26,500 acres), 12,450 were in Monterey and 7,700 were in Santa Barbara County. Each of the districts has significant acreages in both of the two production periods and together account for over 75 per cent of total state acreage. San Luis Obispo County (Oceana district) is the next largest producing county, having a total of 2,800 acres in both seasons; Ventura County also has a sizable acreage, especially for the fall crop. Relatively minor acreages are also located in the San Joaquin Valley. In recent years, more acreage has been devoted to the fall crop than to the early spring crop because of a more favorable farm price for the fall product.

Trends in yields and production

California has high yields because of climatic advantages and successful adoption of improved varieties. The early spring crop generally has higher yields so that there has been more production of early spring broccoli, despite the larger acreages of fall broccoli. The outlook for mechanization is promising if new varieties can be developed which will mature uniformly. With mechanization, however, per acre yields may decrease due to less complete harvesting. Since 1945, yield has been rather stable except for weather-induced variability, so that acreage and production have followed each other closely.


BROCCOLI: Acreage by districts, California
Acres harvested
34,000
32,000
30,000
28,000
26,000
24,000
22,000
20,000
18,000
16,000
14,000
12,000
10,000
8,000
6,000
4,000
2,000
0
State
Central Coast
Southern California
San Joaquin Valley
1940
1945
1950
1955
1960
1965
1970
Year

BROCCOLI: Production and yield per acre, California
Production
Yield
Acres
Production (1,000 lbs.)
Acres harvested
Yield per acre (cwts.)
Year
240,000
230,000
220,000
210,000
200,000
190,000
180,000
170,000
160,000
150,000
140,000
130,000
120,000
110,000
100,000
90,000
80,000
70,000
60,000
50,000
40,000
30,000
20,000
10,000
0
36,000
34,000
32,000
30,000
28,000
26,000
24,000
22,000
20,000
18,000
16,000
14,000
12,000
10,000
8,000
6,000
4,000
2,000
0
80
70
60
50
40
30
20
10
0
1940
1945
1950
1955
1960
1965
1970

BRUSSELS SPROUTS

General description of the industry

California produces 90 per cent of the nation's crop of Brussels sprouts. As with other members of the cabbage family, Brussels sprouts attain best quality if the crop develops and matures in cool weather. The crop is harvested in California from August through March, with October to December the most active harvest period. About three-fourths of California's production is frozen by processors, and California's freezers produce 90 per cent of the U. S. frozen pack annually. New York, with less than 1,000 acres, is the only other commercial producing state.

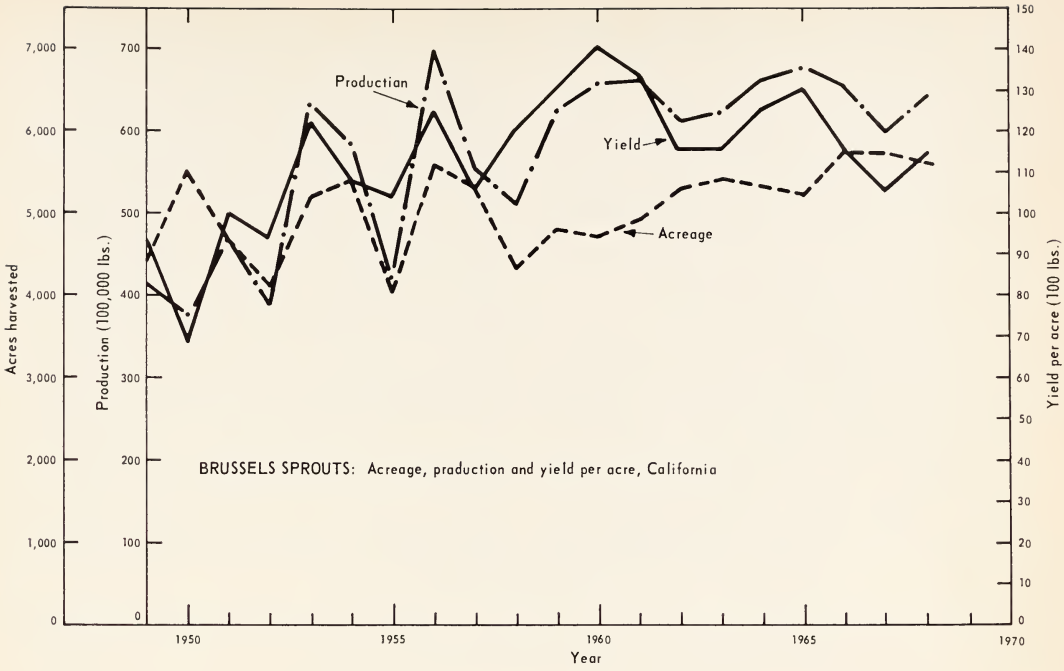
Statistical information concerning Brussels sprouts production begins as recently as 1949, but it is known that the development of the freezing industry in the 1940's spurred expansion of production to present levels. Per capita consumption of frozen Brussels sprouts rose through the mid-1950's and has stabilized at about .25 pounds per person, fresh equivalent—this is two and one-half times the fresh consumption rate, which has been relatively stable since the 1920's. The general instability in acreage, yield, and production which was evident through 1957 was a consequence of an industry experiencing unregulated growth. The industry was heavily reliant upon marketing to freezers, and producers were subject to severe price fluctuations. Extremely low prices in 1957 led to industry-wide support for a regulatory program. Beginning with the 1958 crop, annual volumes of Brussels sprouts for freezing have been regulated under a state marketing program which also supports industry research and a promotional and educational effort with regard to use. Beginning with the 1965 season, the industry has also operated under a marketing order which assures delivery of standardized quality and sprout size to freezers to better meet consumer desires. Recent stability in the industry is attributed to negotiated quantities marketed to processors (based on quotas and historical production bases) which result in more favorable prices to producers.

Changes in acreage and location of production

Production is concentrated in the coastal areas of San Mateo, Santa Cruz, and Monterey counties from Half Moon Bay to Castroville, with minor acreage in San Luis Obispo County. Since the marketing program began, acreage has increased regularly as rising consumer populations increased total demand. Record high prices for the 1965 crop induced a noticeable acreage increase in 1966 and favorable prices in that year maintained acreage for 1967 at that level.

Trends in yields and production

The high yields in the late 1950's and early 1960's resulted from production of hand-picked multiple harvest varieties. The diminution in yield since 1965 is due to the introduction of machine harvesting (actually mechanical sprout stripping from cut stalks) which precludes multiple harvest. Machine harvesting is attractive to producers because of the difficulty in obtaining the labor for harvesting in the Brussels sprouts production areas, which lie outside of California's traditional vegetable crop production areas and field labor pools. Harvest labor requirements in San Mateo County are estimated to have decreased from 333 to 132 hours per acre with a shift from hand to machine harvesting; about 60 per cent of the crop is now machine harvested. Decreased per plant yield of single-harvested determinate varieties has been partially offset by higher plant populations. Variety improvement programs under way should increase yields above levels currently attainable in the early years of the industry's shift to mechanization. Because acreage has increased regularly in the last decade, changes in total production have been closely associated with changes in yield per acre.



CANTALOUPES

General description of the industry

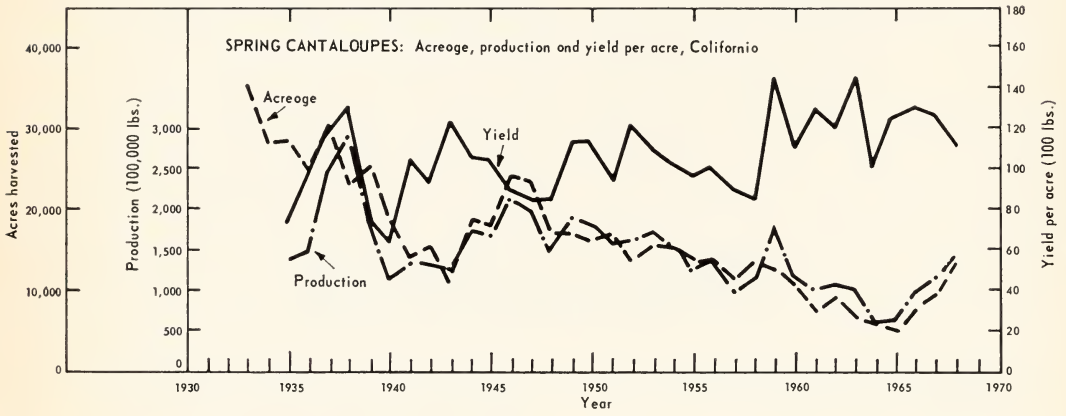
During the last decade and a half, California's share of total U. S. production of cantaloupes has ranged from 45 to 55 per cent. Until recently, cantaloupe production in California was divided into two classes: *spring* production in the southern desert, and *midsummer* production, primarily in the San Joaquin Valley. The normal harvest pattern for California cantaloupes begins in May in the Imperial Valley, gradually moves north into the San Joaquin Valley, and ends in October in the Sacramento Valley. More recently, however, there has been an expansion of *early fall* production in the Imperial Valley where harvest runs from late September through the month of November.

In the 1930's, the desert valleys of Imperial and Riverside counties accounted for practically the entire spring production in the United States. Since then, California has lost part of the spring market—first to the Yuma (Arizona) district and later to Texas. As recently as 1959–1963, California produced one-third of U. S. spring production, but its share has fallen to only one-sixth, while Arizona now produces over one-half and Texas over one-fourth of total U. S. production. In the last decade and a half, the spring crop has fallen from 30 per cent to only 10 per cent of total California cantaloupe production. The midsummer crop is the most important, being about 85 per cent of total California production. The acreage of midsummer cantaloupes in California (primarily from the San Joaquin Valley) has increased from

about one-fifth of the U. S. total acreage in 1939–1940 to about two-thirds in recent years. California now produces 70 to 80 per cent of the U. S. midsummer crop—no other single state produces as much as 5 per cent. California is the sole producer of the early fall crop, and further expansion is likely to meet market needs late in the calendar year.

Spring cantaloupes

A combination of factors has accounted for the decline of spring cantaloupe acreage in California. Diseases, primarily cantaloupe mosaic and crown blight, lowered the yield and quality of cantaloupes in the Imperial Valley, and the result has been a shift to other areas in and outside California. Until 1940, almost the entire California spring cantaloupe crop was produced in Imperial Valley. By 1956, Riverside County (mainly the Blythe area) grew almost as many acres of spring cantaloupes as did Imperial County and, more recently, Riverside has become the major producing area. In addition, production has shifted out of the state to the Yuma district and to Texas and Mexico. Lower transport costs to midwestern and eastern markets have proved advantageous to Texas, even though yields have averaged considerably lower than in the California-Arizona area. Spring cantaloupe yields in California have been highly variable. There has been an increase in the level of yields as a result of shifting production to Riverside County, but, in the main, total production closely follows the decrease in acreage. Harvest for the spring crop extends from about May 1 to July 10, with most active harvest in June.



Midsummer cantaloupes

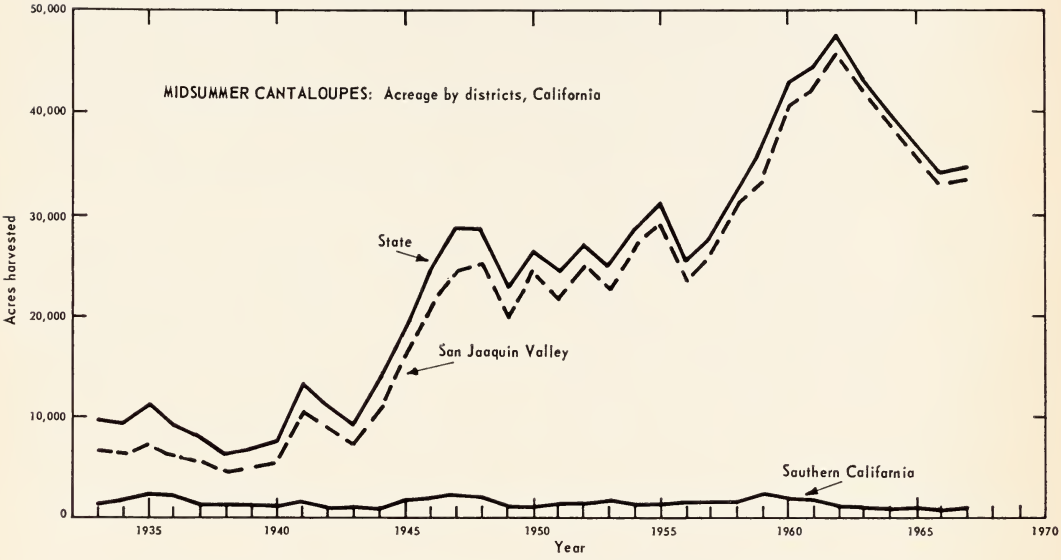
The midsummer cantaloupe shipping season begins about mid-June in the southern California counties (mostly Riverside and Los Angeles, shifting to the San Joaquin Valley in the Delano-Bakersfield district of Kern County, and then to the westside section of the Huron, Coalinga, Lemoore, San Joaquin, Firebaugh, Mendota, Dos Palos, and Los Banos districts. The Tracy-Vernalis-Patterson-Newman-Crows Landing and Turlock-Modesto areas follow a peak in August and September. Late season harvest of small acreages in Butte and Sutter counties in the Sacramento Valley is completed by mid-October.

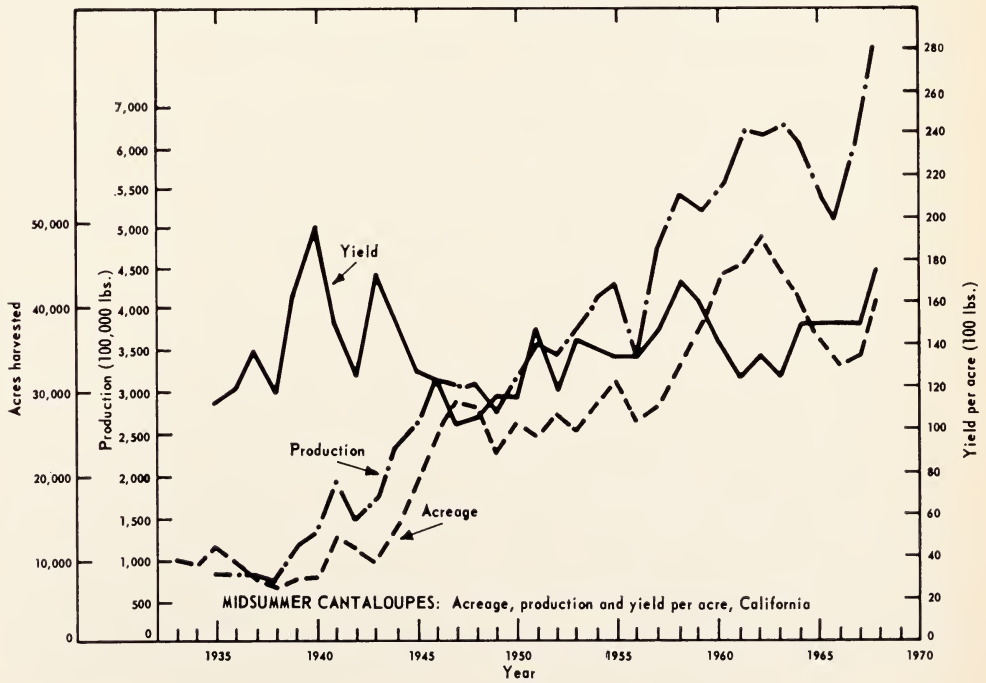
Growth in acreage and production of midsummer cantaloupes followed the decline of spring cantaloupes in southern California. Many growers moved north from the Imperial Valley and most of postwar expansion in acreage was in the San Joaquin Valley. Over two-thirds of the San Joaquin acreage is in Fresno County. Southern California, which markets slightly earlier than the Central Valley, has maintained a minor share of midsummer acreage. Fluctuations in acreage since about 1948 partly reflect grower response to prices of the preceding year. Acreage expansion from 1956 to 1962 was followed by declines because supplies were heavy relative to demand. Yields, in recent

years, have fluctuated less widely than in the late 1930's and early 1940's. This stabilization can be partially attributed to the relative shift in acreage to the San Joaquin Valley from southern California, where early yields were more variable. The development of mildew-resistant varieties has also served to stabilize yields. Total production of midsummer cantaloupes closely follows general acreage trends.

Early fall cantaloupes

The Imperial Valley is the only producer of early fall cantaloupes. There is now no cure for crown blight which afflicts spring crops in the Imperial Valley; the early fall crop is not bothered because there are few insects to transmit the blight in autumn. Harvested acreage has increased since 1960; nearly 2,000 acres are now planted.





CARROTS

General description of the industry

Although competitive forces have reduced California's share of the national production of carrots, it is still the largest producer—growing more than one-third of total U. S. production. Carrots are grown extensively throughout the U. S., and California must compete in markets served by local production during certain seasons of the year. Moreover, California's competitive position has been hurt by consumer acceptance of topped carrots in the market, which gives other producing areas additional advantage in production and marketing at the expense of California production. Per capita consumption of fresh carrots is decreasing, while use of processed carrots has increased sharply. Processed forms not only include canning and freezing uses but also a growing demand for the dehydrated product. Processing allows other states to compete more strongly in the national market, as California has traditionally found its advantage in the fresh market. Further, there has been a fourfold increase in the imports of fresh carrots from Canada in the last decade.

In 1967, California accounted for 22,100 harvested acres of the U. S. total of 81,315. Texas, the second largest producer, harvested 36,600 acres. Other major states with over 1,000 acres (ranked in descending order of acreage) included Michigan, Wisconsin, Arizona, Washington, New York, Oregon, and Colorado. California produces carrots for winter, early summer, and late fall markets. Each of the seasons has rather extended periods of harvest; periods of active harvest are: *winter,* March 1 to May 31; *early summer,* June 1 to August 15; *late fall,* October 1 to December 31.

Competition is important in marketing California carrots throughout most of the year. Shipments of winter carrots from California compete with winter carrots from Texas, and with lesser quantities of spring carrots from Arizona. Early summer carrots from California compete with western shipments of spring carrots from Arizona and late summer production in Colorado and, additionally, with the beginning harvest of carrots in the midwestern and eastern states. The competition facing late fall carrots from California is more severe. Substantial quantities are produced in the midwest and east, and western production of early fall carrots occur in Oregon, Washington, and New Mexico during the beginning of the California late fall harvest. Production of early fall and winter carrots in Texas, and imports from Canada, overlap with all of California's late fall production.

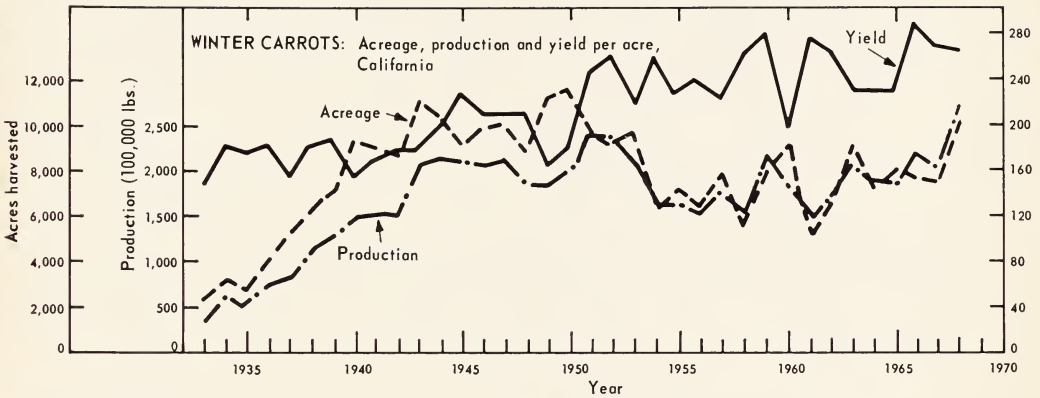
Mechanical harvesting is feasible for all carrots except those which are "bunched," that is, bound together by their tops. All processing carrots are harvested mechanically. While yields of fresh market carrots may be reduced by the use of mechanical harvesters, increases in the relative importance of processed carrots may actually tend to increase yields, since carrots grown for processing are typically left in the ground longer and grow larger than the fresh market product.

Winter carrots

Acreage and production of winter carrots increased rapidly up to World War II, then leveled off and (since 1950) declined. The chief reason for the decline has been increasing competition from Texas—the almost complete changeover from bunched to topped carrots has allowed carrots from the lower Rio Grande Valley in southern Texas to compete strongly on eastern and midwestern markets. In the early 1950's, Texas' production was roughly equal to California's; at present, California's share of winter carrot production has been reduced to one-third of U. S. production, although the yield in California is twice that attainable in Texas. Of course, lower transport costs to eastern, southern, and midwestern markets have been an advantage to Texas. Most of the sales of winter carrots from California are now restricted to Pacific coast, north-

western and Canadian markets. Acreage in California is located in the Imperial, Coachella, and Palo Verde valleys. Increasing competition from Texas has recently triggered a slight shift in acreage from the Imperial Valley to the Coachella Valley where production is a bit earlier. The general level of yields has risen as producers have improved cultural practices and management. Variability in annual yields is due to cold weather damage (in 1949 and 1950, for example) and to the profitability of harvest. When profitability is low, growers market a lesser proportion of their crop.

As an example of this, competition from Texas supplies was strong in 1960 and yield was the lowest since 1950; in fact, some acreage was diverted to cattle feed in lieu of the stagnant market which existed for Imperial Valley winter carrots that year. Heavy supplies from Texas in 1963–1965 also resulted in lower yields during that period. On the other hand, when heavy rains in Texas reduced quantity and supplies in 1966, yields attained their record high and California's winter carrot growers enjoyed their most successful season in over a decade.



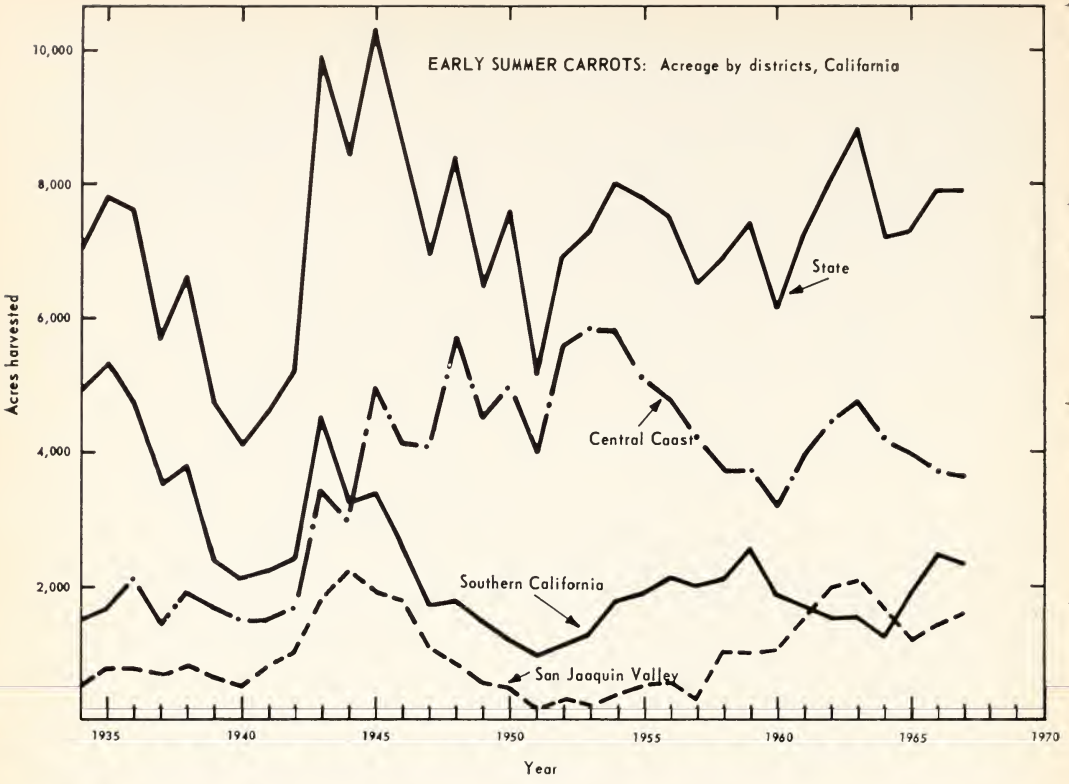
Early summer carrots

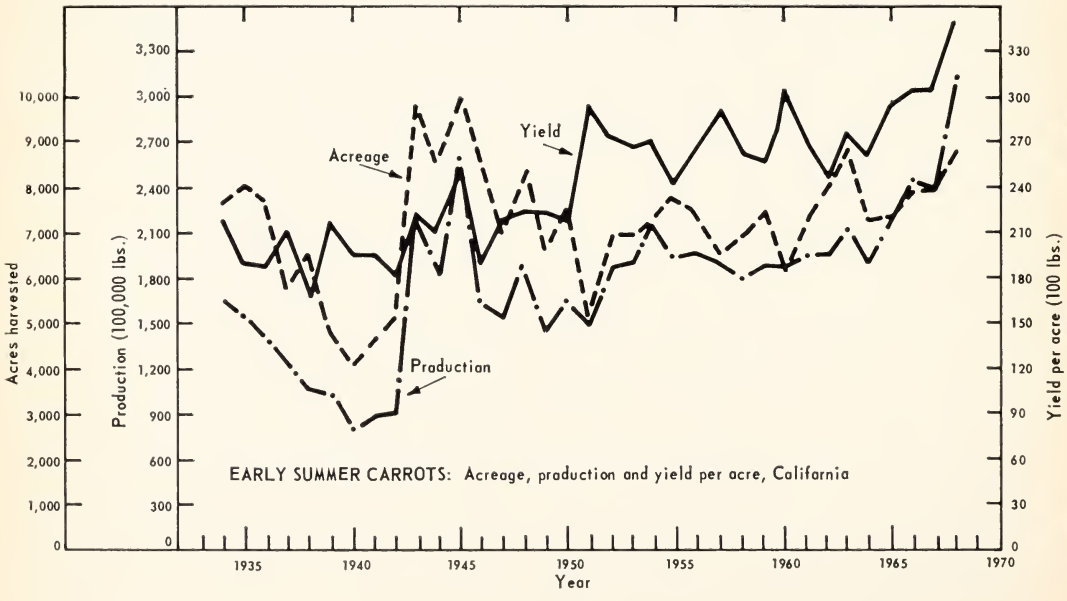
The acreage of early summer carrots increased sharply in 1943 in response to high grower prices in 1942 and a strong demand during World War II. Since then, however, acreage has declined to prewar levels. Year-to-year acreage changes appear closely associated with prices of the previous year. Acreage shifted from southern California (mainly Los Angeles, Santa Barbara, and Ventura counties) to the Central Coast area (primarily Salinas Valley) after World War II. One-half of the early summer carrot acreage is now located in Monterey County. Other important producing areas are found in San Luis Obispo and Santa Barbara counties, and in the San Joaquin Valley in Kern, San Joaquin, and Stanislaus counties. Most of the production in San Joaquin and Stanislaus counties is for processing, while other areas produce primarily for the fresh market. There has been a gradual and irregular increase in average yields. Production has been erratic and usually follows changes in acreage.

Late fall carrots

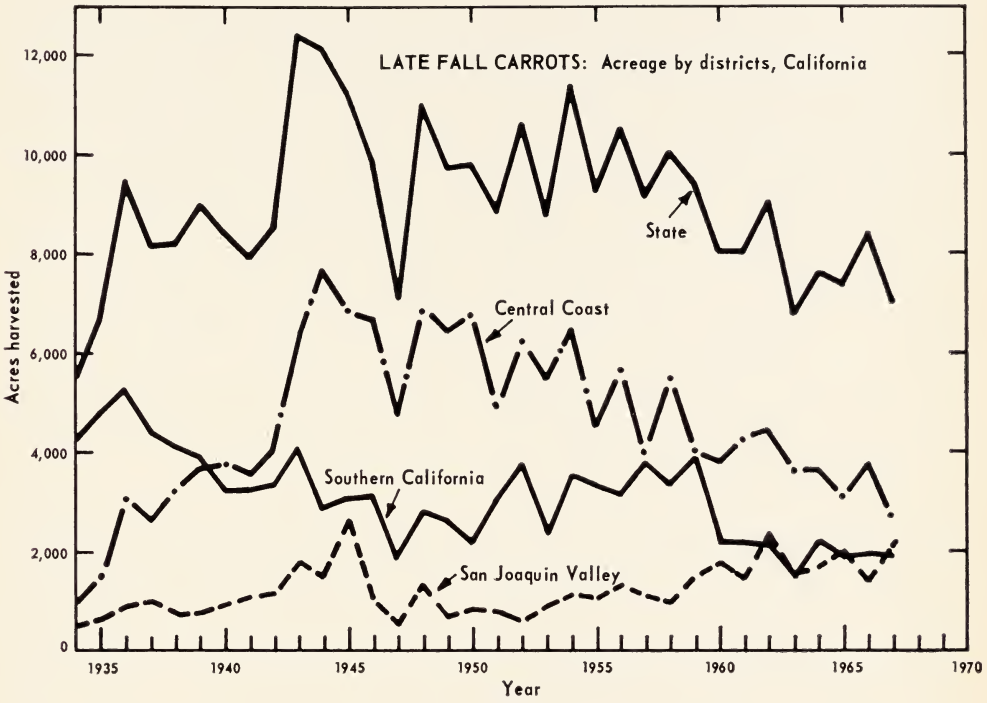
Acreage of late fall carrots shot up in 1943, stimulated by high prices, but since then has trended downward, with annual fluctuations primarily reflecting prices in the previous year. The recent decrease in acreage is due to increased competition from early fall production in Texas. Production in Texas is typically at lower cost, and producers there have fewer production opportunities while California growers may shift to other vegetable crops. Increases in Canadian exports to midwestern and eastern markets may also have reduced California markets for late fall carrots.

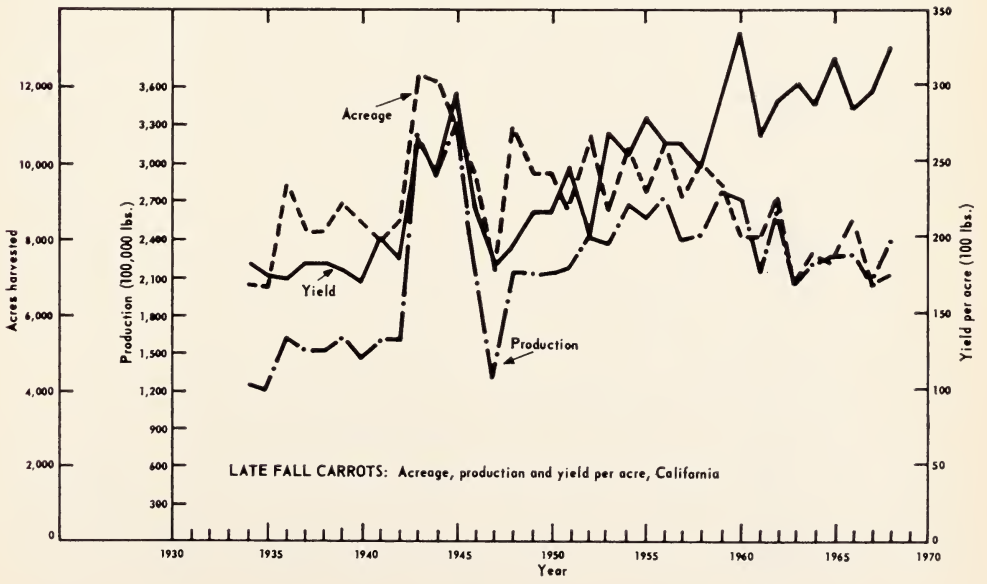
Shifts in the location of late fall acreage parallel shifts in location of early summer acreage. The Central Coast region is the dominant producer, with nearly one-half of total production in Monterey County alone. Los Angeles, Santa Barbara, Kern, and San Joaquin counties are other production areas. The general trend in yields has been up because of improved cultural practices and the shift of production to


EARLY SUMMER CARROTS: Acreage by districts, California
Acres harvested
10,000
8,000
6,000
4,000
2,000
State
Central Coast
Southern California
San Joaquin Valley
1935
1940
1945
1950
1955
1960
1965
1970
Year


Acres harvested
Production (100,000 lbs.)
Yield per acre (100 lbs.)
Acreage
Yield
Production
EARLY SUMMER CARROTS: Acreage, production and yield per acre, California
1935
1940
1945
1950
1955
1960
1965
1970
Year

higher yielding coastal valleys. Exceptionally high yields in 1943–1945 resulted from a combination of exceptionally favorable weather and a lower culling rate to increase tonnage at the prevailing high prices. Total production reflects wide swings in acreage and yield during and after the war. Aside from 1943–1945, late fall carrot production has generally increased from 1934 through the late 1950's. More recently this production has lessened because of the fact that acreage reductions in the 1960's have exceeded the general trend of increasing yields.





CAULIFLOWER

General description of the industry

California is the nation's largest producer of cauliflower, averaging about 60 per cent of total U. S. production. In California, cauliflower is produced in late fall and early spring and is essentially in peak harvest from early October through May. During this period there is little competition on fresh markets except for some from Texas and Arizona. Other major producing states (mainly New York, Oregon, Washington, Michigan, and New Jersey) market during summer and early fall seasons, and compete in eastern and midwestern markets only in October and November.

California's production finds outlets in both fresh and frozen forms. Typically, about 30 per cent of the California crop is delivered to freezers. Prior to 1959, only 40 to 50 per cent of the U. S. pack came from California, but since 1959 California has accounted for 60 to 70 per cent of the U. S. frozen pack of cauliflower, with most of the remainder being frozen in other western states. Typically, fresh shipments from California (on an annual basis) make up about one-fourth of the unloads in eastern markets, nearly one-half in midwestern and southern markets, and about 80 per cent of those recorded in western markets. The changing tastes of consumers have had an extreme effect on cauliflower marketings over time. Per capita consumption of fresh cauliflower declined sharply from 3.5 pounds in 1945 to 1.3 pounds in 1954 and is now relatively stable at about 1 pound per capita.

The three major production districts in California are Salinas-Watsonville (Monterey, Santa Cruz), Irvington-Alvarado-Centerville (Alameda), and Santa Maria-Guadalupe-Oceana (Santa Barbara, San Luis Obispo). These three districts all of which produce in both seasons, account for about 70 per cent of the state's harvested acreage. Santa Clara, Fresno, Stanislaus, Orange, and Ventura counties are among the major producing areas of the remainder of the districts.

Changes in acreage and location of production

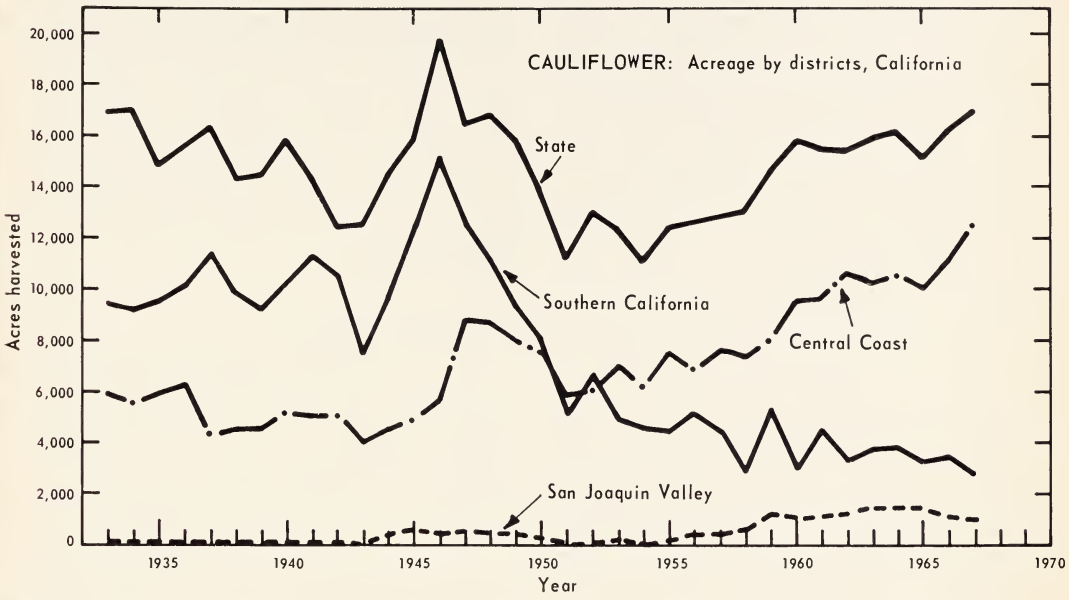
The effect of declining per capita demands for fresh cauliflower in the postwar period is evident in the sharp acreage decrease noted from 1946 through 1955 (except for Korean War demands). Total state acreage fell from 21,900 to 12,400 acres over this period. Prior to 1950, the acreage in southern California surpassed that of any other state crop-reporting district. In 1946, the year of peak acreage in California, Los Angeles and Santa Barbara counties accounted for 10,200 of the state's 21,900 producing acres. Production is now concentrated in the Central Coast counties, with Monterey County surpassing all other counties in California (7,500 of 17,000 acres in 1967); acreage in Monterey County was only 1,000 acres in 1946. Los Angeles' acreage declined from 5,800 in 1946 to only 200 acres in 1967.

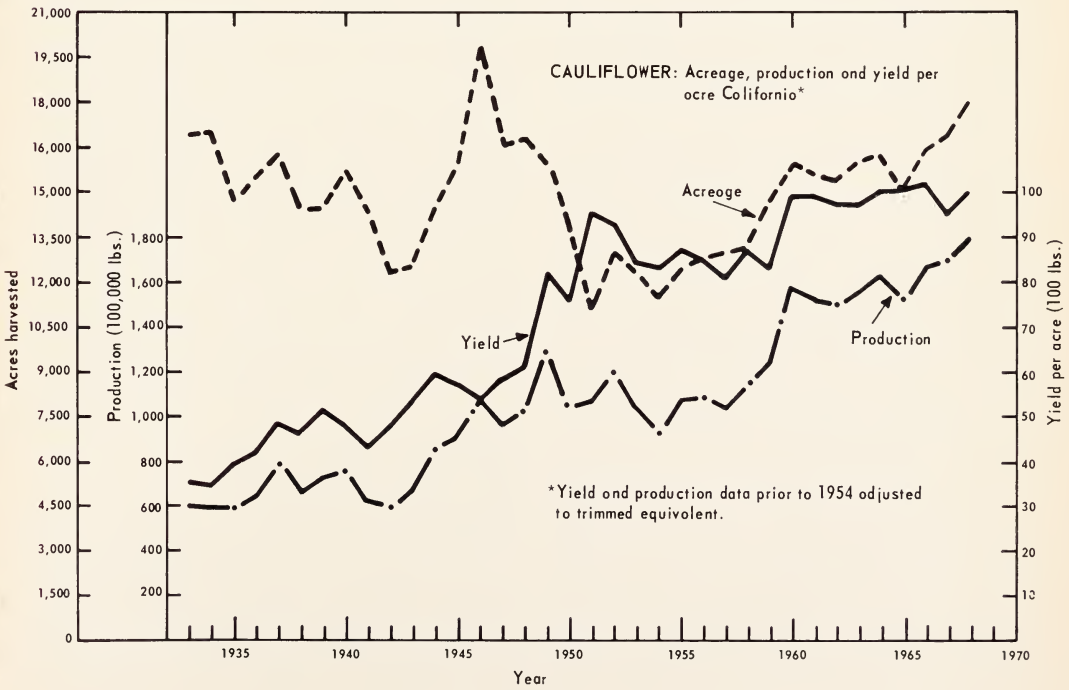
Total state acreages have increased from the low in 1955 because of increasing demands by freezers. In contrast to declining per capita consumption of fresh cauliflower in the postwar period, per capita demand for frozen cauliflower rose sharply until the mid-1950's and is now relatively stable. Early spring production is now concentrated in Monterey and Alameda with significant marketings from Santa Barbara, San Luis Obispo, and Santa Cruz counties. Late fall production is dominated by Monterey County, with substantial production in Alameda and Santa Barbara and lesser production from eleven other counties. During the 1960's, production in the two seasons has been about equal, although late fall acreages have increased more above their 1955 levels than have early spring acreages.

Trends in yields and production

The shift from southern California to Central Coast districts' dominance of cauliflower production coincided with a sharp increase in yield due largely to a more

suitable (cool) climate during transplanting and maturation periods of plant growth. In addition, improved varieties and better cultural practices adopted by the vegetable industry have contributed to an increase in yields. Generally, yields per acre are higher for late fall production—which may partly explain the noted increase in late fall acreages since 1955. Total production was relatively constant from the mid-1940's through the late 1950's because changes in acreage were largely offset by changes in yields per acre. Production has risen since 1960, mainly because of increases in acreage, as yields per acre have been relatively constant.





CELERY

General description of the industry

California is the nation's largest producer of celery, with over one-half of total U.S. production on about 45 per cent of the national acreage. The second most important producing state is Florida, where about one-third of U.S. production is located; sizable commercial production is also found in Michigan, New York, Ohio, New Jersey, Texas, and Washington. Celery, marketed only in its fresh form, is produced in four seasons in California. Although each of the seasons have somewhat more extended periods of harvest, we identify them by their usual periods of active harvest as follows: *winter,* January 1 to March 31; *spring,* April 1 to June 30; *early summer,* June 1 to August 31; and *late fall,* October 1 to December 31. For our discussion, the spring and early summer seasons are combined. Celery harvest begins with the winter season in the south coast area of southern California and moves generally north along the coast through the spring, early summer, and late fall seasons. Roughly 25 per cent of the total California acreage is planted to winter celery, 35 per cent to spring and early summer celery, and about 40 per cent to late fall celery.

California's winter and spring celery production competes with the same seasonal crops from Florida. Florida has been increasingly competitive in eastern markets and has gained a larger share of production as a consequence; California now averages about one-third of national winter production and two-fifths of spring production. The largest proportion of California winter and spring celery is distributed in the west; the midwestern market is shared about equally with Florida celery. California's celery is also able to compete in markets nearer to Florida, partly because of better appearance, and because it has been a steadier source of supply. Production of early summer celery in the Central Coast overlaps with the latter part of the marketing season for the spring crop from southern California. The chief competitors are Michigan and New York. California is the only producer of late fall celery, although it must compete at the end of the season with the first shipments of winter celery from Florida.

Some mechanical harvesting equipment and mechanical transplanting machines have been used, but development of precision planting and mechanized blocking equipment has not yet been successful. Almost all southern California acreage is transplanted to minimize effects of cold weather, while Central Coast acreage is directly seeded in the field because planting dates are after expected periods of low temperatures.

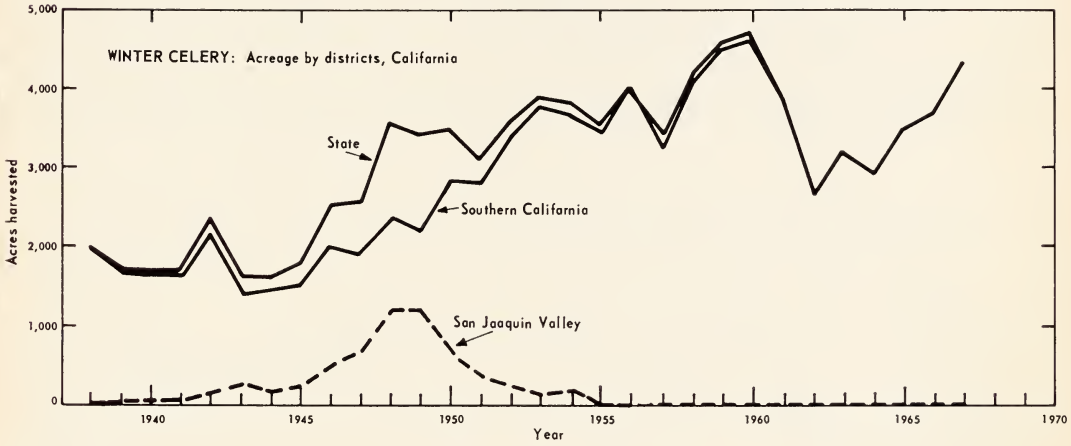
Winter celery

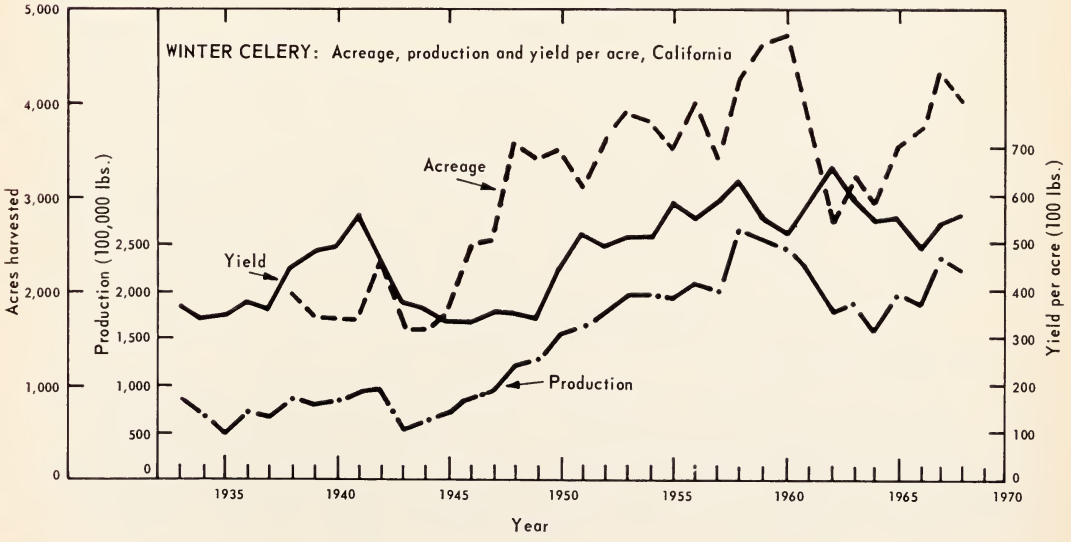
Southern California provides the major shipments of the state's winter celery. Harvested acreage is above prewar levels, although lower than the high of 4,700 acres noted in 1960. Poor returns to growers, competition from increased production in Florida, and pressures of urbanization reduced acreage in the early 1960's. Population pressures in southern California have forced production out of Los Angeles County and reduced acreage in Orange County. The Chula Vista district in San Diego County and the Oxnard district in Ventura County are the major production areas. High wartime demand encouraged plantings in Tulare County (Terra Bella), but this area has since gone out of production because of damaging frosts and cold weather. Average yields of winter celery have not increased appreciably since the 1940–1941 level. In fact, average yields were depressed during the late forties as low-yielding Tulare County briefly entered the picture.

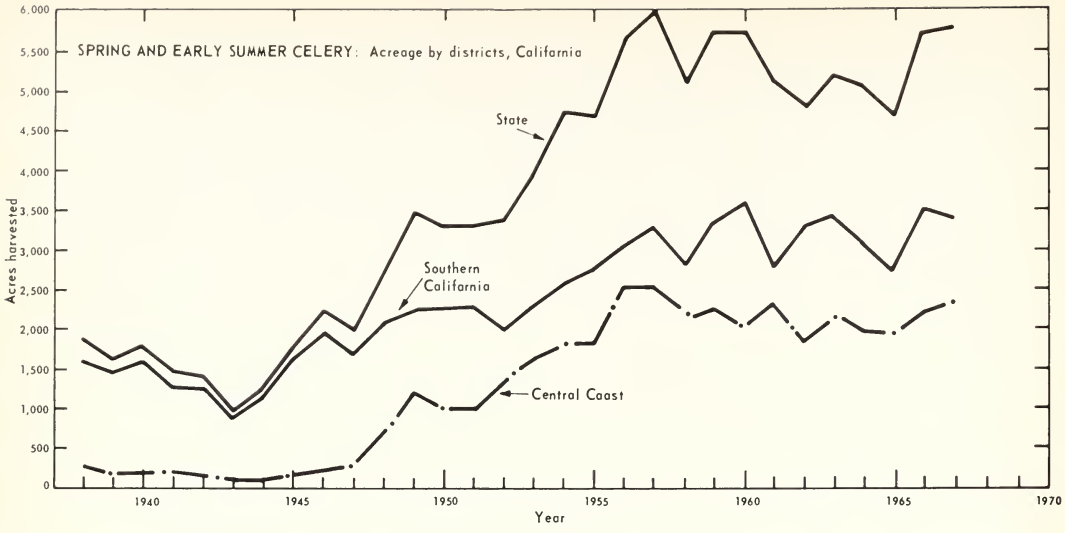
Spring and early summer celery

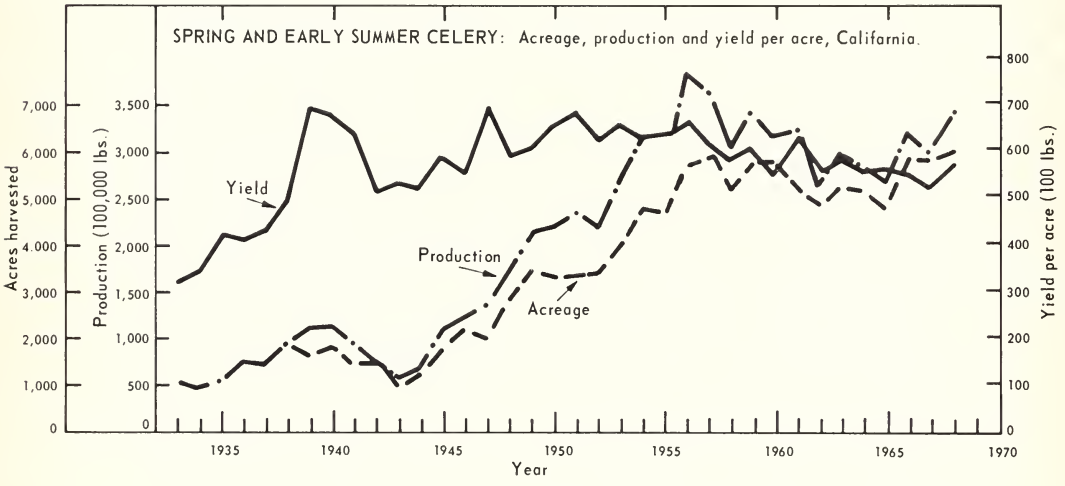
The Venice-Oxnard districts produce most of the California spring celery crop. Orange County production has been affected by real estate developments, and Los Angeles no longer is an important

production area for the same reason. These losses cannot be offset by acreage increases in Salinas because of the tendency for celery to bolt when exposed to low temperatures. As a consequence, production is lower than levels of the 1950's, and Florida is now the relatively more important production area nationally (60 percent). The early summer crop comes from the Central Coast region, with production concentrated in the Salinas-Watsonville district and the Oceana district of San Luis Obispo County. California's production in this season has increased in relative importance and now makes up about two-thirds of the U.S. early summer crop. Yields have shown no upward inclination so that changes in acreage are the main effects on total production. Acreage growth has been faster in the Central Coast than in southern California because of new slow-bolting varieties that can be set out earlier in





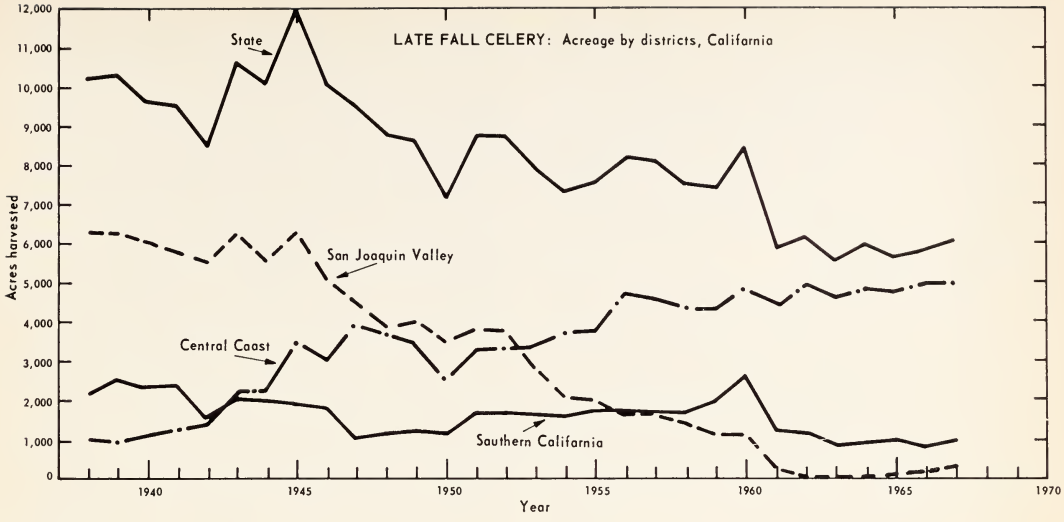


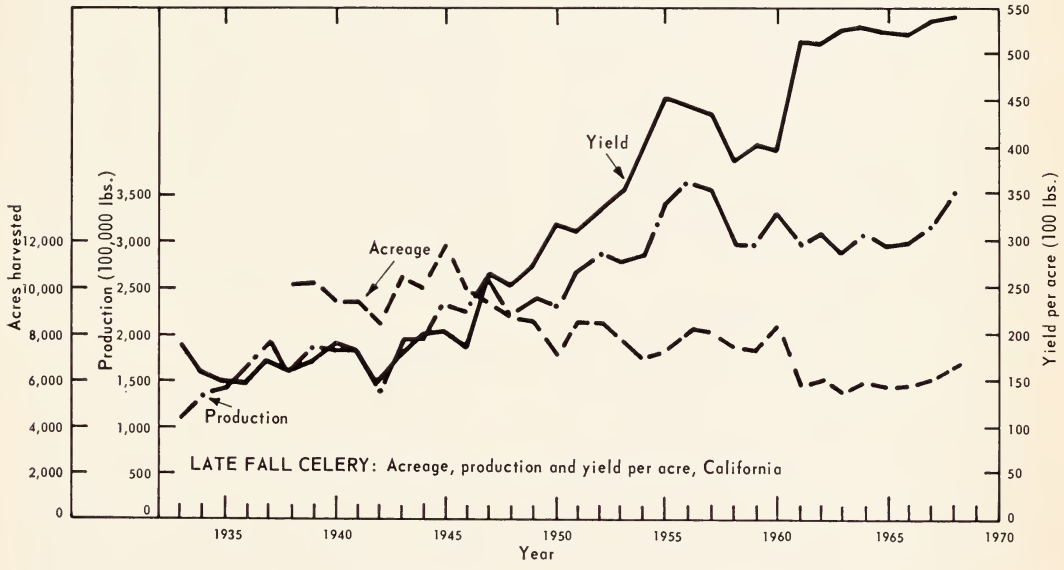


cooler climates. Acreage and production of spring and early summer celery increased steadily over the postwar period until 1957; since then, Florida's competition has tended to reduce growth.

Late fall celery

Late fall celery production is centered in the Salinas-Watsonville district of Monterey County. The other important producing districts are Oceana and Santa Maria-Guadalupe. Acreage in the Delta (San Joaquin Valley) has shifted to the Central Coast where better yields are expected, and where there is better access to vegetable buyers in the late fall season. Late fall celery yields have increased sharply because of improved cultural practices and the shift of production to the higher-yielding coastal valleys, but have leveled off after the shift from the Delta was virtually accomplished by 1960. The general increase in yield offsets acreage declines; total production increased through the late 1950's and has since remained near that level.





LETTUCE

General description of the industry

California is by far the most important single commercial lettuce-growing area in the United States—averaging slightly over 60 per cent of national production. Lettuce is California's second most important vegetable crop in acreage, production, and value (tomatoes rank first). California's

share of the total market has been relatively constant despite the fact that total national production (and consumption) has increased. However, there have been significant changes in the location of production and the season of marketings in the western lettuce industry in which Arizona is a major competing source of supply—producing 20 to 25 per cent of national production.

Because lettuce is consumed fresh, the industry has developed so as to provide fresh supplies every month of the year. California presently retains the dominant competitive position in the production of head lettuce because of its ability to deliver a stable flow of higher-quality supplies. Its most serious competitive disadvantage is its greater distance from major consuming centers, and the consequent higher transportation costs. Recent developments indicate that as labor costs rise, California will realize benefits from conversion to mechanization which may not be obtainable by other regions. Efficient utilization of mechanical methods depends upon high and stable yields in areas where irrigated farming predominates; hence, the application of mechanized lettuce farming is likely to be less successful in midwestern and eastern regions.

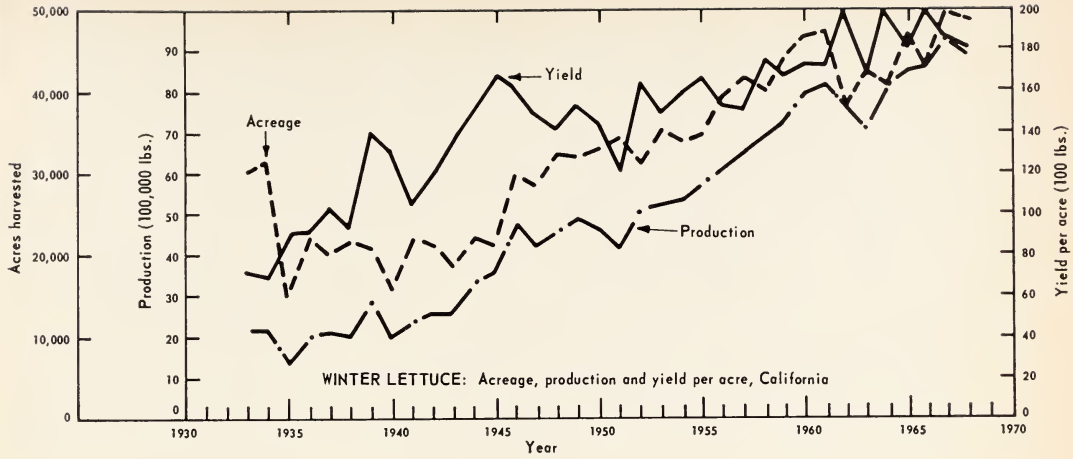
Variable weather conditions in both production and marketing areas and the high perishability of the commodity affect supply and quality and, consequently, contribute to price instability. Market timing is vital in determining prices and returns. Excellent crops are sometimes left unharvested if prices are low. In an effort to minimize the risk associated with the production of lettuce, financial responsibility and the assumption of risk have shifted from independent growers located in only one producing region to shippers and grower-shippers with year-round operations in several regions. Lettuce production and marketing in California, and in the neighboring districts of Arizona, is now governed largely by decisions of year-round shippers who move their operations from district to district as changing weather conditions require. This industry structure may serve to result in the rapid adoption of mechanized techniques as they become available.

Lettuce can be produced commercially in counties of the Central Coast and southern California regions and in the Central Valley as far north as Solano County. California lettuce data are reported by the following seasonal groups: *winter lettuce,* harvested November 20 to April 30; *early spring lettuce,* harvested March 25 to May 31; *summer lettuce,* harvested June 1 to August 31; and *early fall lettuce,* harvested September 1 to December 15. California is a major production area in all four seasons. The seasonal shifting of production from one district to another, beginning with winter production in the Imperial and Palo Verde (Blythe) valleys and shifting northward to the Salinas Valley and other ancillary production areas in the spring through fall seasons, permits California producers to supply markets steadily throughout the year.

Before World War II, the various lettuce-producing areas of California and Arizona had well-defined marketing periods, but in recent years lettuce shipments from the major districts have overlapped increasingly as producers have attempted to extend their shipping seasons. Production in new districts both in California and Arizona has also impinged on the markets of established districts.

Winter lettuce

The Imperial Valley and the Blythe district supply about two-thirds of the total U.S. winter lettuce production. In general, the winter crop accounts for one-third to 40 per cent of total acreage and a major portion of total farm value of lettuce produced in California. Acreage in the Imperial Valley fluctuates more than in the Blythe district. In the 1960's, Imperial acreage ranged from 31,000 to 42,000 acres as compared to a narrow range of 6,000 to 7,000 acres in Blythe. The chief competitive state is Arizona, where production in the Salt River Valley and Yuma districts provide market competition both before and after the Imperial Valley active harvest period, which ranges from January 1 through mid-March. Competition is generally more severe for the Blythe district where active harvest occurs from the latter part of November through mid-December,



and where second winter plantings are timed to mature in early March as Imperial production begins to decline. Despite the strong Arizona entry into lettuce production, California districts have maintained their market share because of increasing demands for winter lettuce. Texas and Florida also provide market competition on eastern markets in the early part of the winter season.

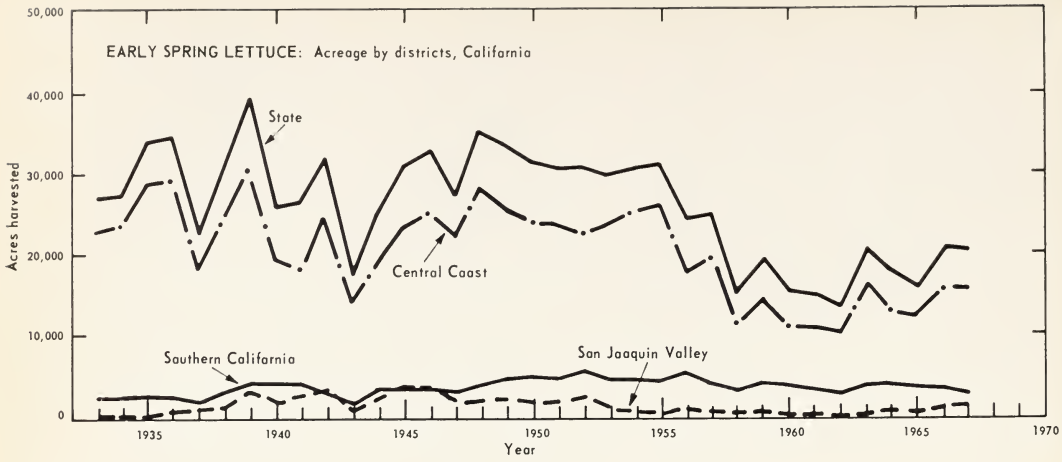
Acreage of winter lettuce in California has expanded greatly since World War II. Yields per acre, though highly variable from year to year, have tended strongly upward. Factors contributing to the general yield increase have been more intensive cultivation and improvement in production practices—such as disease and insect control, new improved varieties, and changes in irrigation practices. In addition, marketing situations affect harvested yields importantly. Recent high yields in 1962, 1964, and 1966 are associated with very favorable price situations. Increased acreages in following years (1965 and 1967 in particular) in response to high market prices had associated with them relatively poor market prices and, consequently, lower yields in terms of quantity of lettuce actually harvested. As the result of increases in both acreage and yields, production has continually increased since 1940.

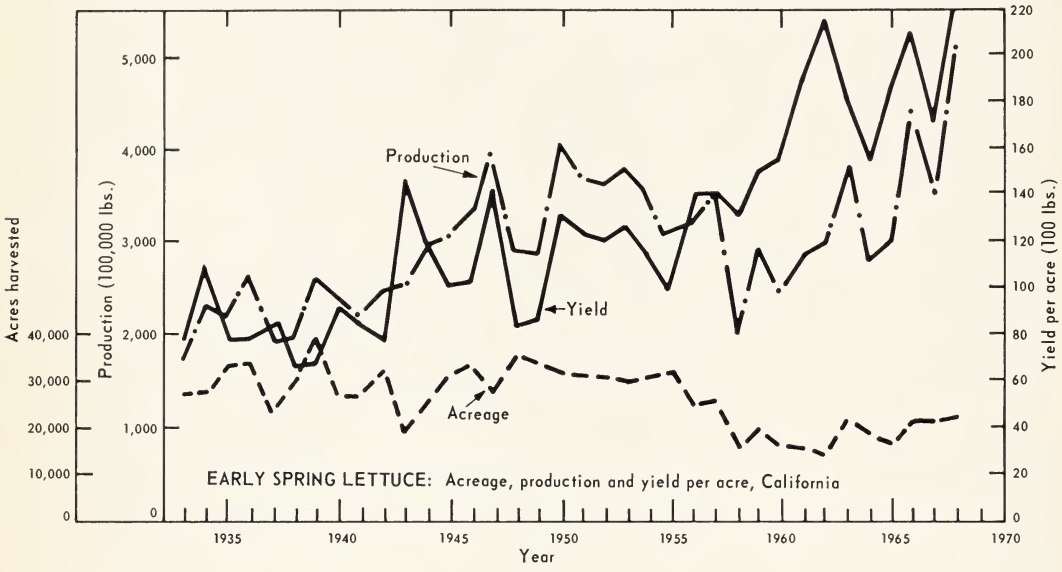
Early spring lettuce

California's dominance of marketings of early spring lettuce has been strongly challenged by Arizona production, primarily in the Salt River Valley and Wilcox districts. Arizona has benefited by the development of new varieties which withstand more heat and effectively extend production later into the year. From mid-1950's through 1965 Arizona production surpassed California's, but a reverse shift since then has returned dominancy to California production.

The effect of this competition is the significant decrease in acreage in California from the postwar high of 35,200 acres in 1948 to a low of 13,800 acres in 1962, although there have been increases since then. Further increases in acreage may occur if underground water is severely overdrafted in Arizona. Additional competition may develop late in the season from expanded production in the Las Cruces district of New Mexico.

The Salinas-Watsonville-King City district is the major production area in California—Monterey County alone produces about two-thirds of early spring production. Ventura, Fresno (Firebaugh-Panoche district), San Luis Obispo, Santa Barbara, and Kern counties are also significant production areas. The peak of shipments from the Salinas area has shifted from April to May as the Salt River Valley area has moved into the earlier part of the period. The shift toward a shorter spring season in Salinas has also been encouraged by adverse weather which often delays April harvest, and by greater demands for lettuce in May because of higher temperatures.





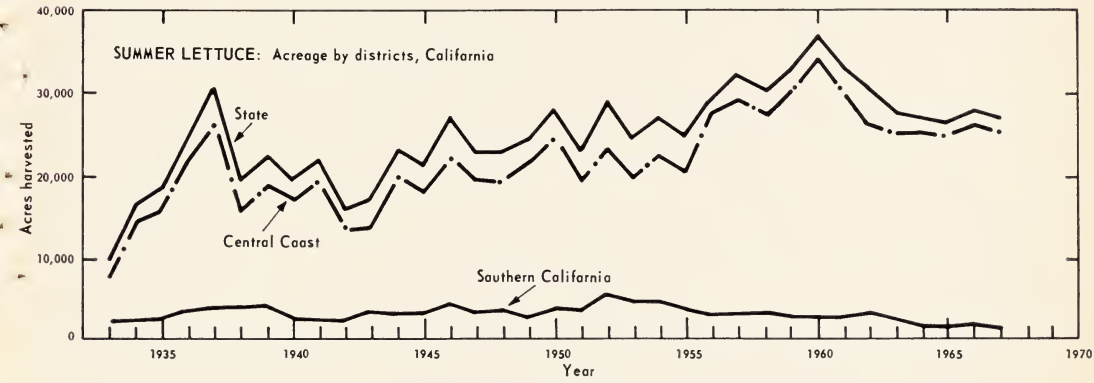
Year-to-year fluctuations in acreage appear highly correlated with prices received in the previous year. Wide fluctuations in yield before 1950 were partly due to disease (primarily lettuce mosaic and tipburn). Great Lakes-type varieties, adopted in about 1948, have since provided more consistent yields. Since 1957, yields have increased strongly. Post-World War II production increases are more importantly due to yield advances as acreages have generally been decreasing. Prior to the World War II period, variations in production were more closely associated with fluctuations in yields per acre.

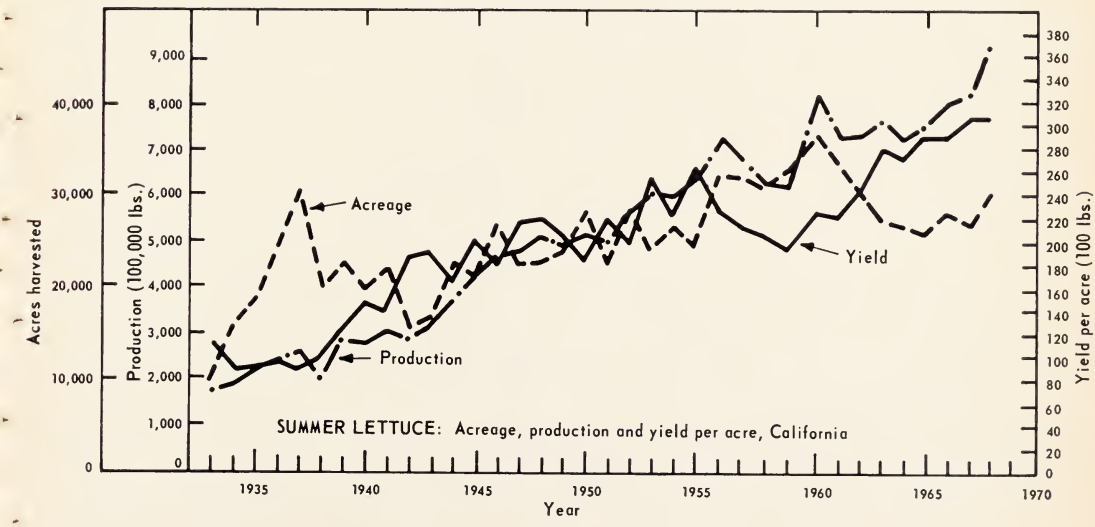
Summer lettuce

The Salinas area is the major commercial shipper of California lettuce during June, July, and August. Monterey County alone accounts for about 80 per cent of harvested acreage. Other coastal counties producing significant quantities are San Luis Obispo, Santa Barbara (Santa Maria-Guadalupe district), and Santa Cruz. Urbanization pressures have reduced production in Alameda and Santa Clara counties. California production competes with early season marketings of lettuce from the Wilcox district of Arizona, and with eastern

and midwestern production from Colorado, New York, Wisconsin, Michigan, and Ohio. Despite increased competition from areas closer to the major consumption centers, the Salinas Valley is likely to remain the dominant producer of high-quality summer lettuce because of its relatively cool summers. California production amounts to two-thirds or more of the total national production.

Production of summer lettuce in California has risen steadily in a fourfold increase from the mid-1930's to the present. Through 1955, production closely followed the increase in yields as acreage fluctuated about a relatively constant level. (Increases in yield were due to better insect control, improvements in other cultural practices, and a shift to Great Lakes-type varieties.) Yields for summer lettuce are substantially higher than for production in the other marketing seasons. Sharp increases in acreage from 1955 to 1960 were offset by low harvested yields per acre due, in part, to economic forces and to lettuce mosaic. More recent acreages are near pre-1955 levels once again, and high yields have contributed to increases in production.



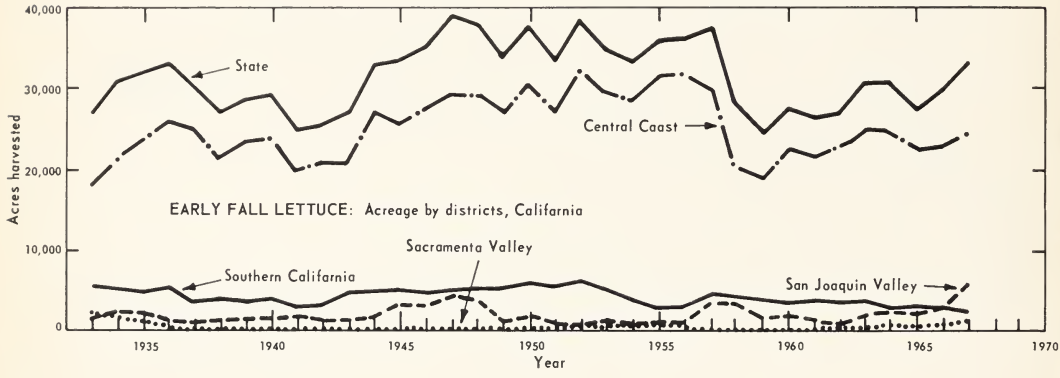


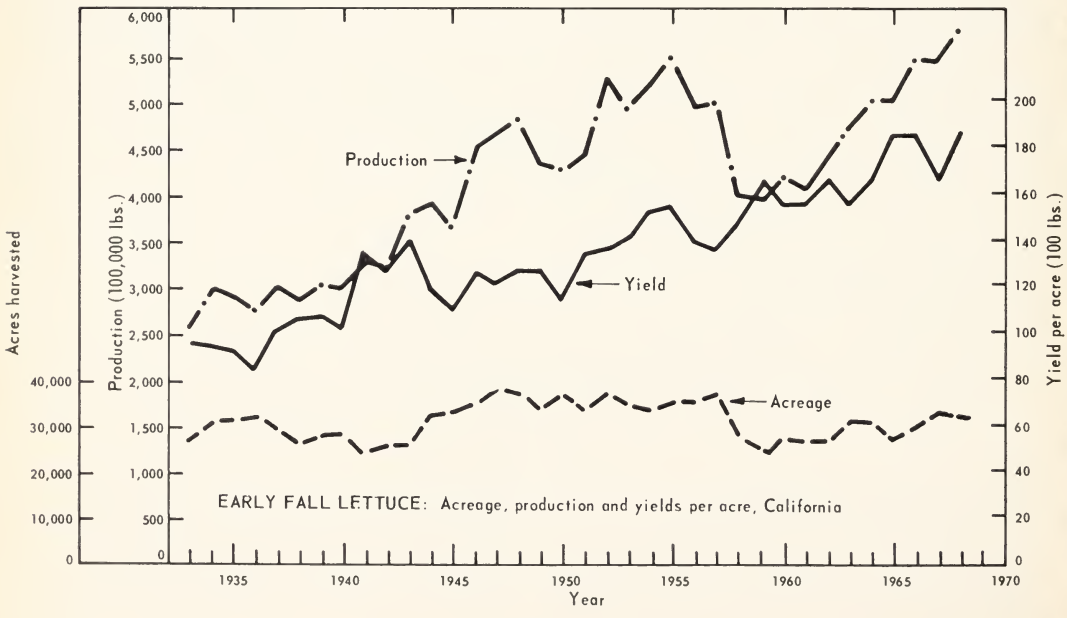
Early fall lettuce

The Salinas-Watsonville-Hollister area is also the major producer of early fall lettuce—about one-half of the harvested acreage is in Monterey County. Other significant production districts (with 1,000 or more acres) are Santa Maria-Guadalupe, Brentwood-Patterson-Dixon, Firebaugh-Panoche, and Kern and Ventura counties.

Late season shipments in November and December have been affected by competition from the Salt River Valley and Yuma area. Concentration of marketing in September and October has contributed to increased yields, as rain in the coastal area is often unfavorable to November and December marketings. In addition, increase in yield since 1963 is due to control of the lettuce mosaic.

Production increased slightly through 1955, and then fell sharply as acreages were reduced in the face of strong Arizona competition. California's acreage reduction was importantly affected by new developments in the Wilcox district beginning in 1957. Arizona production has decreased steadily in this decade. Again, recapture of additional acreage by California may be possible if overdrafting of water in Arizona is not eased in the near future. However, more recent development of the Las Cruces area of New Mexico poses new competition to California's early-fall lettuce production. More efficient production and marketing has permitted increases in acreage and production since 1959. Recent increases in production are associated mostly with rising yields per acre because acreages have been relatively constant.





ONIONS

General description of the industry

Increase in onion production in the last decade can be attributed to growth in the market for processed forms of onion products, chiefly dehydrated onion products. Although onions are grown commercially in all parts of the U.S., the onion dehydration industry is concentrated in California because of the long production season in various portions of the state, which permits a year-round supply to dehydration plants. Recent estimates are that 50 to 65 per cent of total California onion production is dehydrated. Dehydration reduces bulk and eliminates loss due to shrinkage, spoilage, and sprouting. Principal markets for dehydrated products are: the remanufacturing market for use in manufacturing catsup, chili sauce, soups, and sauces; the hotel, restaurant, and institution market; and the household market. Canned and frozen products are other important processed markets for California onions.

Because of the growth of the processing market, California's share of U.S. commercial production has increased from less than 20 per cent to nearly 25 per cent in recent years. New York is the other major producing state while Texas, Oregon, Michigan, Colorado, Idaho, Washington, New Mexico, and Arizona are other significant production areas. California's production dominates the late spring onion market (about two-thirds of the production) and shares importance with New York for late summer onions, with each state producing about a quarter of the production.

The most active period of harvesting in California extends from early May through the end of September. Fourteen counties devote substantial amounts of acreage to onion production. Late spring onions are produced chiefly in San Joaquin and Imperial counties with significant production also in Riverside and Kern counties. Kern, Imperial, and Monterey counties are the primary production areas in the late summer season, but sizable quantities are also produced in Riverside, San Joaquin, and Siskiyou. The late summer crop is grown from the Mexican to the Oregon borders.

Shipments of fresh onions from California are important in eastern and midwestern markets from May through August, and are the dominant source in western markets through September. The processing industry utilizes a considerable portion of the late summer crop. Onion harvesting is becoming more mechanized as processing outlets increase. Much of the processed onions are grown under contract with processors who sometimes harvest the crop themselves.

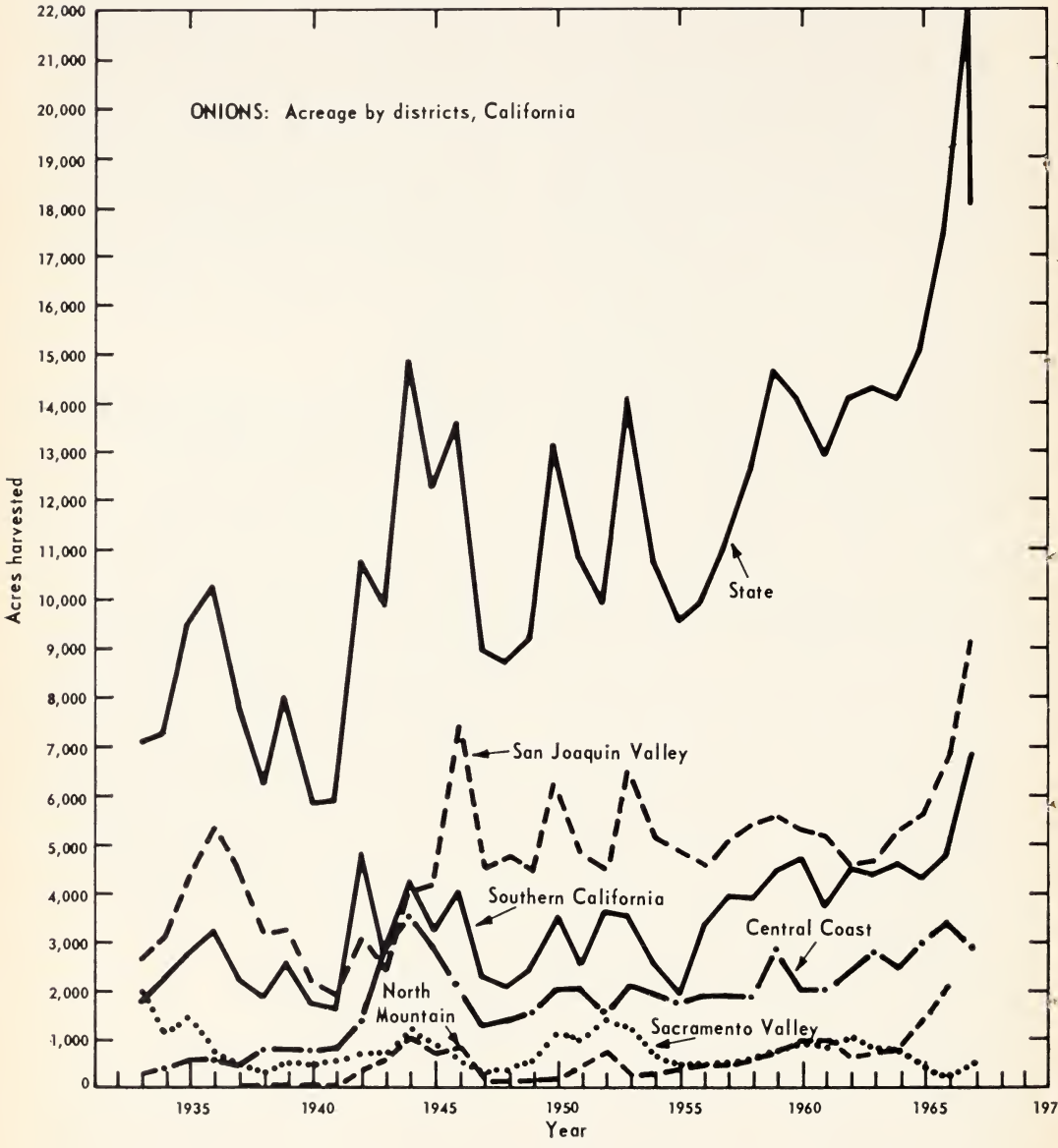
Changes in acreage and location of production

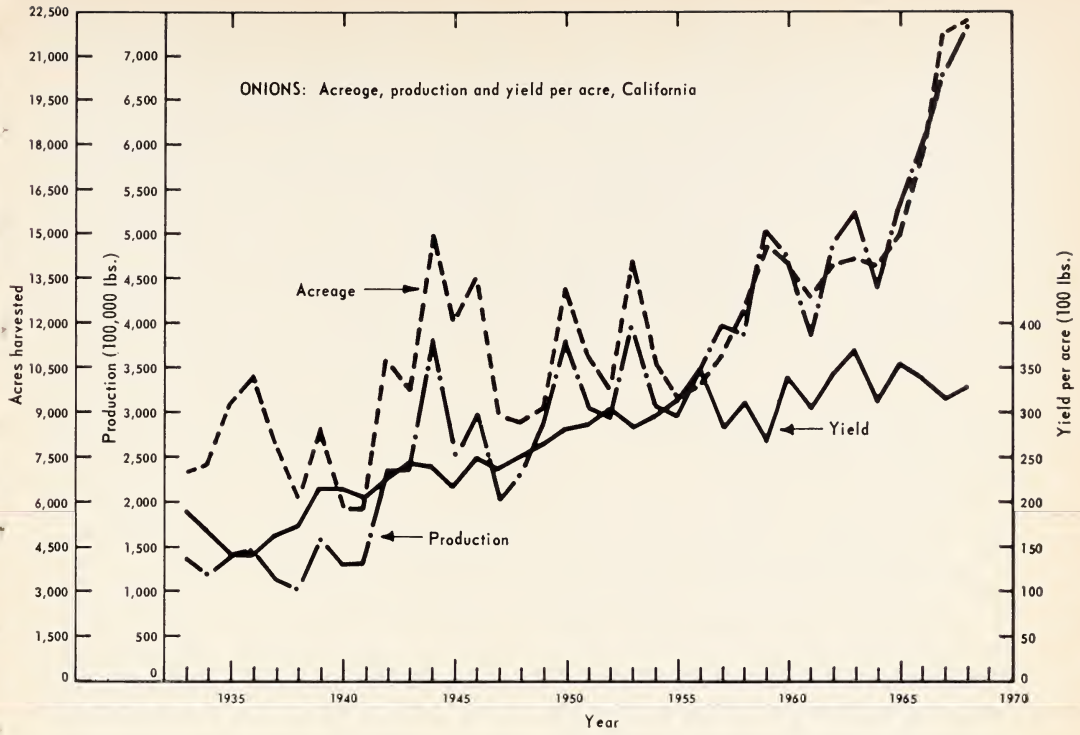
Total acreage of onions increased from 9,500 acres in 1955 to 21,600 acres in 1967. Late summer production has accounted for essentially all of the growth in acreage in response to demands for larger quantities by the processing industry. Late spring production (concentrated in San Joaquin and Imperial counties) has remained at about 4,000 acres. In contrast, late summer production increased from only 5,700 acres in 1955, 7,200 acres in 1956 and 1957, to 13,000 in 1966, and 16,000 in 1967. The largest increases occurred in Imperial, Kern, and Monterey counties in the southern California, San Joaquin Valley, and Central Coast districts, respectively.

Trends in yields and production

Yields increased due to improved seed, development of disease-resistant varieties, and better cultural practices including improved pest and weed control. Weather importantly affects onion yields and causes variations from trend. Yields for the late summer crop average from 10 to 20 per cent above yields for late spring production, partly because processing outlets for late summer onions can utilize field run production whereas small and off-grade

onions are not as marketable on the fresh market. Total production has closely followed changes in acreage levels because yields have been relatively stable.





POTATOES

General description of the industry

Changes in the U.S. potato industry can perhaps be best understood by first looking at long-term shifts in consumption patterns. From 1910 to 1950, the U.S. per capita consumption of potatoes dropped by nearly 50 per cent. Reasons advanced for this have been higher real incomes, less heavy manual labor, diet consciousness, increased variety of competitive foods, and urbanization. Since 1950, however, the per capita consumption has stabilized because of the sharp increase in the use of potato chips and dehydrated potatoes and, more recently, frozen potatoes. Use of potatoes in processed form now represents over one-third of total consumption and is expected to continue increasing.

In the last 50 years U. S. potato production has increased by about 50 per cent despite a 60 per cent drop in acreage, the decline in acreage being more than offset by tremendous yield increases. Reasons for the yield increase are shifts from low-yielding to high-yielding areas, shifts from small growers to large specialized growers, and improved cultural practices such as increased irrigation and fertilization, new varieties, and more efficient control of insects and disease. U. S. production has also shifted geographically in recent years. In 1955, Maine was the leading potato state, followed closely by Idaho and California. Since then, Idaho production has more

than doubled while Maine and California production remained relatively constant. As a result, Idaho now has an output roughly equal to that of California and Maine combined. Washington production has also increased sharply in the last 10 years. Because of seasonal considerations discussed below, a relatively high percentage of California's crop goes to the fresh market, and therefore commands a substantially higher price than the Idaho and Washington crop, where a greater proportion is processed.

Late spring and early summer potatoes

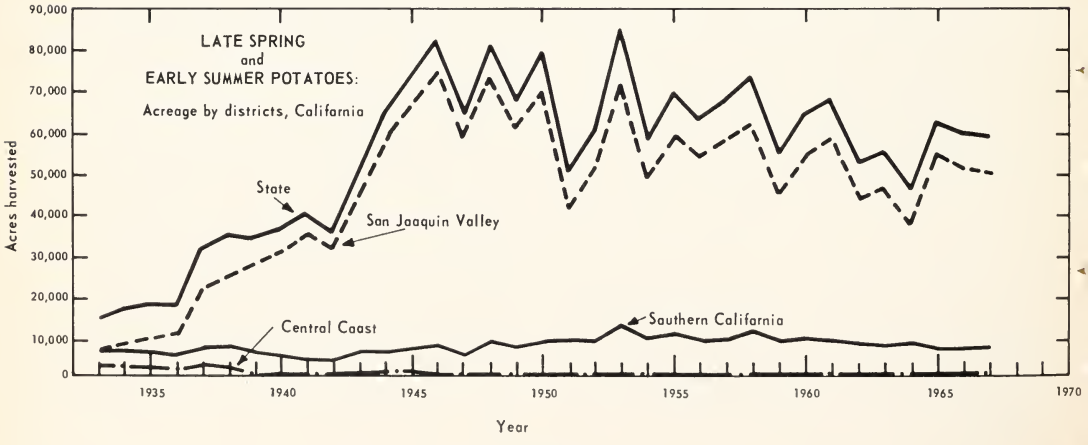
California harvests during five of the six potato producing seasons (*winter, late spring, early summer, late summer,* and *fall*). The main season is late spring when the San Joaquin Valley (principally Kern County) supplies about two-thirds of the U. S. production from April 10 to July 10. The leading variety in this area is the White Rose, marketed under the name "Long White." The White Rose is a long, elliptical potato with a smooth, white skin, grown best in light soil with uniform moisture (usually supplied by irrigation). Soil and climate favoring the White Rose have encouraged production in this area. However, the particular advantage held by Kern County growers lies in their ability to market new potatoes ahead of other areas. Nevertheless, there is competition during this season from processed potato products and from potatoes stored from the previous season.

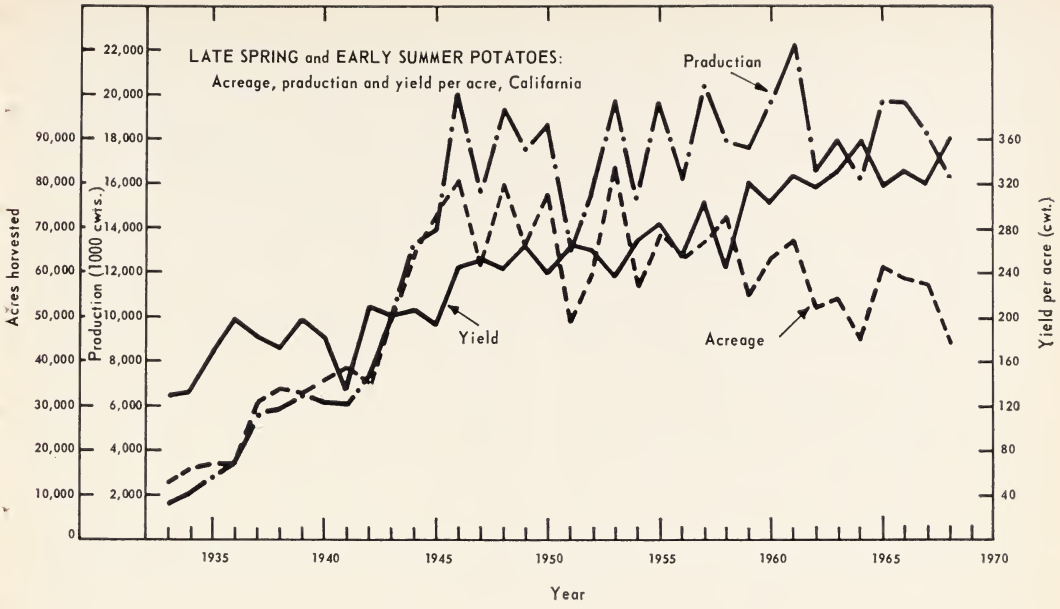
Rapid expansion of the Kern County potato district in the late 1930's and early 1940's was encouraged by an increasing level of prewar and wartime demand. The "sawtooth" pattern of acreage since the war largely reflects the response of producers to alternately favorable and unfavorable prices in the previous year. Acreage has tended to be somewhat lower in the past 10 years due to several years of unfavorable prices. However, increase in yields over the same period has held general production levels about constant. Yields have increased due to increased fertilizer use, adoption of improved irrigation and soil management practices, and better disease and pest control.

Early summer potato production in California is entirely from the southern California area, primarily Riverside County. Production in this season represents only about 18 per cent of the U. S. supply.

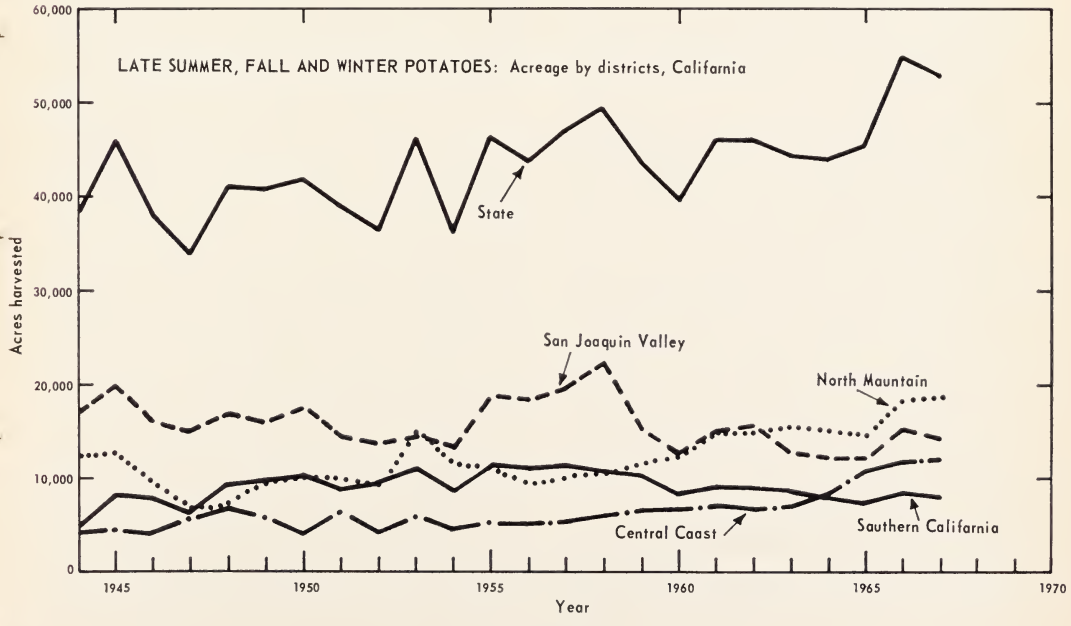
Late summer, fall, and winter potatoes

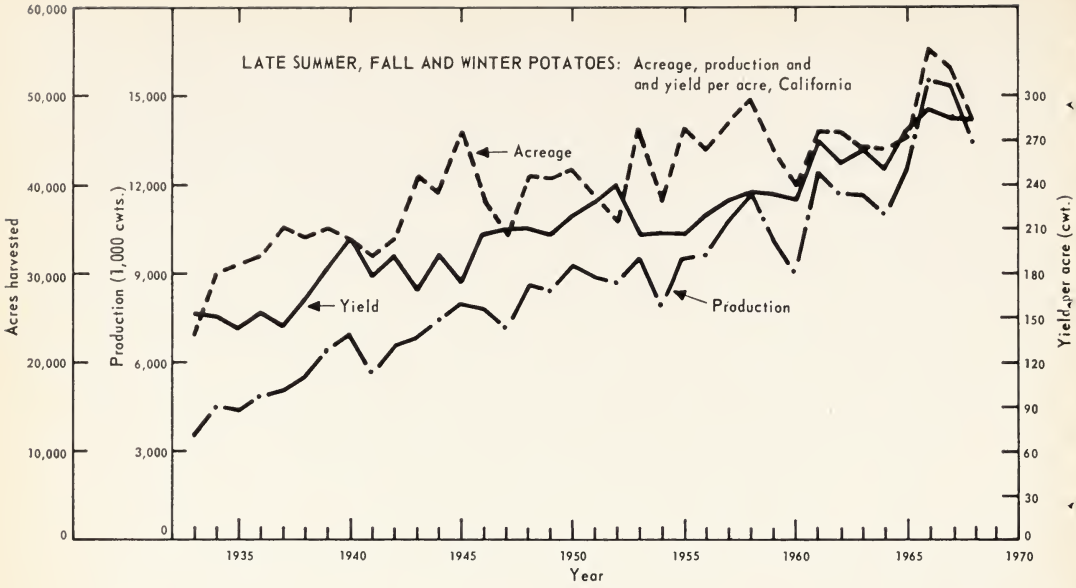
Late summer production is primarily from San Joaquin and Monterey (Salinas Valley) counties, plus smaller amounts from southern California. Fall production is harvested from the northern mountain district (Tulelake) and the Salinas Valley. While





the fall season represents the second most important production season in the state, marketing from the other major potato states are at a peak during this season. California represents less than 5 per cent of the market in the fall, but becomes a dominant factor in the winter market when the San Joaquin Valley (mainly Kern County) and Riverside County produce over two-thirds of the U. S. supply. Over the past 40 years there has been a rather steady increase in yields of late summer, fall, and winter potatoes, due to improvements in management and cultural practices similar to those listed for the late spring crop. Acreage has also increased generally, resulting in a strong increase in the state's production.





STRAWBERRIES

General description of the industry

California leads the nation in the commercial production of strawberries, a crop which has important fresh and processing markets. Over 40 per cent of total U. S. production is produced in California on only slightly more than 10 per cent of the national acreage. Development of the quick-freezing process and improved facilities for shipping perishable fruit to distant markets, combined with California's ability to produce, have led to the production of 45 to 50 per cent of the U. S. fresh crop and 30 to 40 per cent of the processing crop in California in the mid-1960's. Production in California, Oregon, and Washington now accounts for 85 per cent of processed strawberries and an even higher percentage of frozen product.

The history of strawberry production in California is that of change and response to competition. For discussion, production can be grouped into three periods: prior to World War II; postwar to 1956–1957; and 1956–1957 to the present. Before World War II, California's strawberry acreage averaged 5,000 to 6,000 acres and production was marketed entirely in fresh form on local markets. Production was larger in many states, including Louisiana, North Carolina, Tennessee, Arkansas, Michigan, and Oregon. During the war, Japanese sharecroppers who formerly produced most of the strawberry crop were evacuated from the producing areas. The lack of skilled growers accounts for the sharp dip in acreage in the war years. After the war, state acreage expanded sharply until acreage in 1956 was nearly four times the prewar level. This phenomenal growth, largely in response to the development of the quick-freezing process, reflects an exceptionally favorable economic picture for strawberry producers. Newly developed varieties increased yields; favorable climatic conditions and adoption of cultural prac-

tices shifted production from a fresh, seasonal crop to production in longer harvest seasons favorable for the processing industry. Favorable prices brought high returns and stimulated new acreage. By 1956, nearly two-thirds of California's production had its outlet in the freezing industry and California was producing one-half of the nation's processed strawberries. At the same time population growth within the state provided an expanded market for fresh fruit, and improvements in transportation of perishable products permitted shipments to eastern markets. Sharecroppers still produced an important portion of the crop, but many growers attained ownership and shifted to larger and more commercial types of operation.

The postwar boom period ended with all-time low prices for the 1957 crop. Favorable prices had overstimulated production which, coupled with growth in other strawberry-supplying areas (particularly in the northwest) and a slowing in the increase in per capita consumption of strawberries, led to large stocks in freezers. Low-quality fruit was also a problem. Low prices and serious problems of industry adjustment forced many small independent growers out of business in the late 1950's. The recent trend has been towards large owner operations of 100 to 200 acres or more. The industry in California has now shifted towards production for fresh-market utilization, where generally about two-thirds of production found its outlet in the 1960's (although processing markets are still important).

The developed ability to produce strawberries nearly year-round makes California an important fresh-market producer—it is now possible to have continuous production of high-quality fruit from early spring to the time of fall rains. California production is concentrated in southern California through April when the Central Coast comes into strong production. Heaviest supplies for out-of-state markets are available from April to mid-November, but large in-state markets receive shipments every month. The processing season generally lasts from mid-April to November, utilizing some late spring production from southern California and heavier supplies from the Central Coast. Production in the Central Coast area allows out-of-state shipments through November but faces competition from late spring southern and eastern production on eastern markets, particularly in May and June. More rapid and flexible truck and air transport has replaced reliance on rail shipments. Air shipments are important to the large New York-Newark and Chicago markets, and newly developed international markets have increased air shipments of strawberries (particularly to Frankfurt, Stockholm, and London).

Production from Mexico provides additional competition to U. S. and California strawberry producers. An expansion from 4,400 to 11,000 acres occurred in Mexico from 1960 to 1965. About 80 per cent of Mexican production is frozen and exported to U. S. and Canadian markets, although fresh shipments enter the U. S. from November through May. Heaviest in-shipments are in the first three months of the year.

Two marketing orders are in effect. The first was authorized in 1955 and assesses fresh shipments to out of state as well as all processing quantities. Revenues are used for promotional and research activities. A second marketing order (1960) covers only processing strawberries. It authorizes and requires grading and inspection of all strawberries converted into strawberry products, and also requires reporting of prices received for processing strawberries.

Changes in acreage and location of production

Before the war, each of the four major producing districts of California contained a substantial share of the state's 5,000 to 6,000 acres of strawberries. After the war, total acreage expanded from about 1,000 acres in 1945 to 20,700 acres in 1957. Of the total, over 14,000 acres were in the Central Coast, and about 3,500 and 2,500, respectively, in the southern California and San Joaquin Valley districts. Expansion was greatest in the Central Coast area, primarily because of a particularly favorable climate which allows substantially higher yields and continuous bearing of

fruit throughout the summer. The Central Coast area successfully grows the Shasta variety, one of two varieties important to the strawberry industry, which was developed by the University of California in 1945. Acreage was largely concentrated in the Salinas-Watsonville area. The southern California expansion was based largely on the ability to produce early spring strawberries for fresh markets. Production was mainly in Orange and Los Angeles counties, the Oxnard Plain, and the Fallbrook area in San Diego County. Areas in the San Joaquin Valley (mainly Manteca-Modesto and Fresno) increased acreage because they could produce a strawberry that came on the market after southern California production and 10 days to 2 weeks ahead of the Central Coast, which uses the second variety, Lassen. The prewar strawberry-producing center in Florin (Sacramento County) was not revitalized due partly to the fact that production coincided with that in the Central Coast and Sacramento yields were considerably lower than those attainable in the Central Coast with postwar varieties.

Total acreage in California is now about one-third of the 1957 high (8,000 versus 20,700 acres). The shift from frozen to fresh markets after 1957 severely curtailed acreage in the Central Coast and to a lesser extent in the San Joaquin Valley. Southern California and Central Coast acreages are now nearly the same. Southern California's acreage is in annual plantings as is the tendency throughout the state. New varieties are now available for winter production in southern California which may further increase acreage in that area.

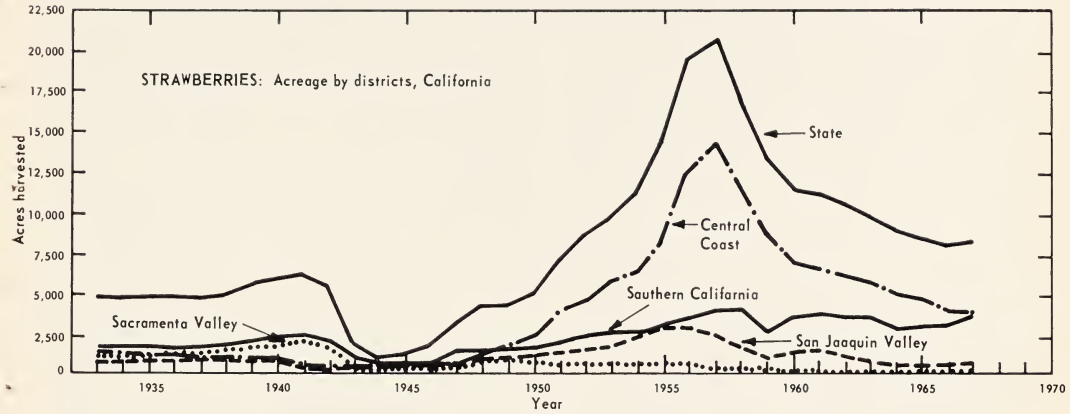
Trends in yields and production

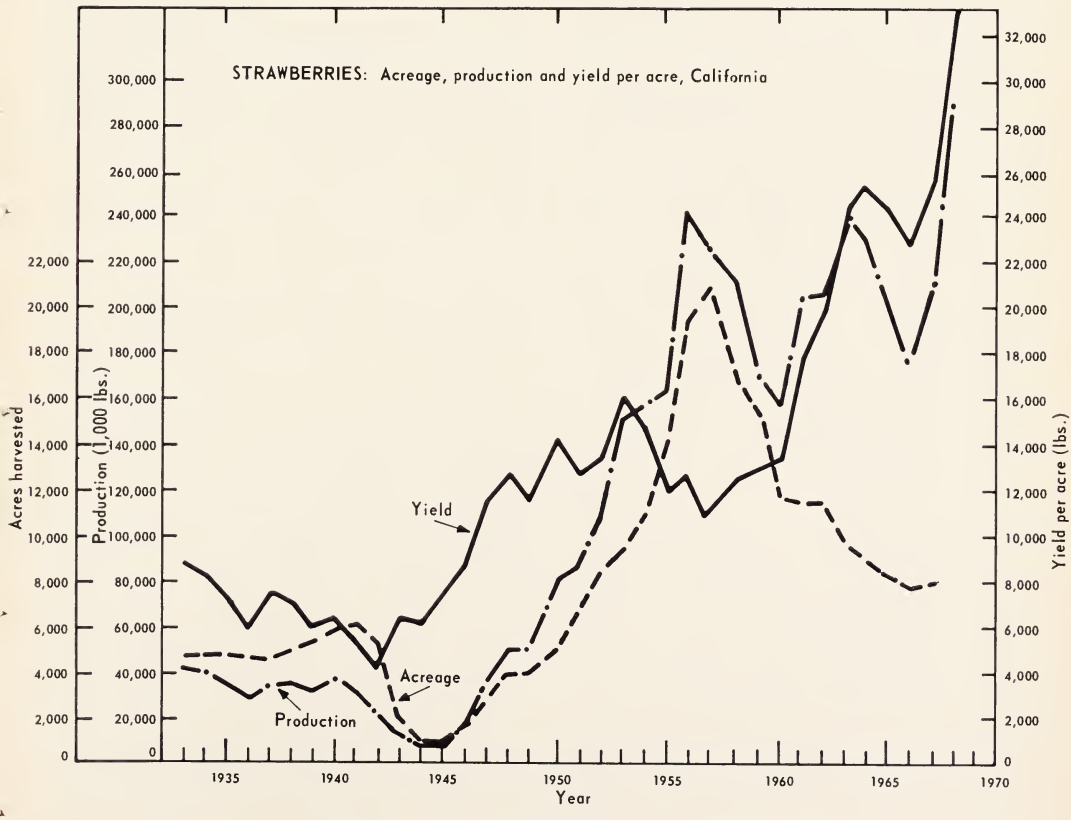
California strawberry yields declined in 1933–1942, primarily because virus diseases increased in incidence and severity. The low point of 1942 also coincides with the removal of skilled Japanese from the strawberry farms. In 1945, new varieties were released which were well adapted to California conditions and tolerant to the then prevalent virus diseases, and the sharp increase in yields after the war can be largely explained by widespread adoption of these improved varieties. Favorable prices also encouraged intensification of such cultural practices as fertilization and weed control. A tendency for yields to level out during the 1950's may be partially explained by the following factors: complete adoption of the new varieties by 1949; increasing virus infestations because of concentration of acreage; some shift from sharecroppers to general farming and the use of day labor; lack of new land adapted to strawberry production; and failure to eliminate old plantings after production had fallen off. Weather also has an important influence on yield level and variability. For example, the pre-1961 record yield in 1953 resulted from a season exceptionally favorable to strawberry production. In other years (1956, for example), late spring rains reduced yields.

Following reductions in acreage after 1957, yields have increased strongly—present yields are almost three times those recorded in the mid-1950's (34,000 pounds compared to 12,000 pounds per acre) and the yield potential is increasing. Low yields in 1965 and 1966 were due to labor difficulties and light summer production, respectively. Present yields are five times the U. S. average—more than double those in Florida, the second ranking state with respect to yields and more than three times as heavy as in Oregon, the third ranking state. The rising yields of the 1960's are due to important innovations in the industry. The change to annual summer plantings during the last decade has had almost universal adoption in southern California and the Central Valley, and is in the offing for Central Coast production. Southern California yields have more than tripled. New varieties, such as Tioja and Fresno, have high yield potentials and are disease resistant although disease resistance is of lesser importance with practices now adopted throughout the industry). Soil fumigation and the use of polyethylene bed mulch are recommended and used on all plantings. Virus problems have been solved by annual plantings and by the isolation of nurseries and their establishment as separate, but allied industries, together with the state certification program. Tehama and Shasta counties are locales for strawberry nurseries which provide high

elevation plants to the industry. All of the above have contributed to higher yields and have permitted production to be concentrated on the best soils in the best climate zones.

Total production has been affected by yield and acreage changes noted for the industry. From 1945 to 1956, production increased strongly in response to both yield and acreage increases. Decline in production from 1956 to 1960 was due to acreage reductions during the adjustment from heavy reliance on the frozen market for strawberries, while sharp rises in yields in the 1960's resulted in production increases through 1964, despite continued reduction in acreage. Labor difficulties in 1965 resulted in the loss of about 25 million pounds of strawberries not marketed because of harvesting problems.





FRESH TOMATOES

General description of the industry

Consumers in the U. S. enjoy fresh tomatoes every month of the year. Sources of seasonal supplies are determined primarily by climate. Tomatoes are grown commercially in 28 states, but California and Florida are the major producing states, each with about 30 per cent of national production. California produces about 15 per cent of the U. S. early spring crop, one-third to nearly one-half of the early summer crop, and the entire early fall crop. During the late fall, winter, and early spring, Florida is the principal source. In the late fall and early spring, Texas is a major supplier and Mexico supplies large quantities during the winter and spring. Production is widespread during the late spring and summer months with South and North Carolina, New Jersey, Virginia, New York, and Michigan being major producers among the many production areas.

California's production is classified in three seasons: *early spring,* harvested from about December 1 to July 10 (mainly May-June); *early summer,* harvested from about June 1 to August 31 (mainly July-August); and *early fall,* harvested from September 1 to January 10 (mainly September-October). Thus, peak harvest occurs from May through October, although some production finds outlets on local and western markets throughout the year. Shipments to midwestern and eastern markets are usually heavy from June through November.

Of California's 58 counties, 20 report commercial production for fresh markets. However, the major portion of fresh market acreage (32,600 acres in 1967) is concentrated in Monterey (6,100), Merced (5,500), San Diego (5,300), San Joaquin (4,350), Stanislaus (2,870), and Ventura (2,600) counties. Climate determines the origin of seasonal shipments. Shipments of early spring tomatoes begin in Imperial Valley and the Chula Vista district in San Diego County in late May and June, and then shift to the early summer crop from Merced County and the Cutler-Orosi district in Tulare County in mid-June through July and to the summer crop from San Diego in late July through August. Late summer and early fall production is largely in the Gonzales-Soledad-King City area of Monterey County (late July-early November), northern San Joaquin Valley (San Joaquin and Stanislaus counties, August to mid-November) and San Diego (September through December). If supplies are plentiful in the fresh market in eastern states due to favorable weather, midseason producers may be forced to divert acreage intended for fresh markets to processors. It has been a common practice to market fresh tomatoes from early pickings, particularly in Merced and Monterey counties, and then to divert later ripening fruit to processing. Mechanization has not yet been successfully adapted to harvesting fruit for fresh markets, but prototype machine harvesters are now being field tested. New varieties and cultural practices are also being developed for mechanical harvesting. If successful, mechanization will reduce costs and make California production more competitive on fresh markets. New varieties suitable for mechanized harvest may also have earlier maturity. These new developments could expand California's fresh marketings.

Early spring tomatoes

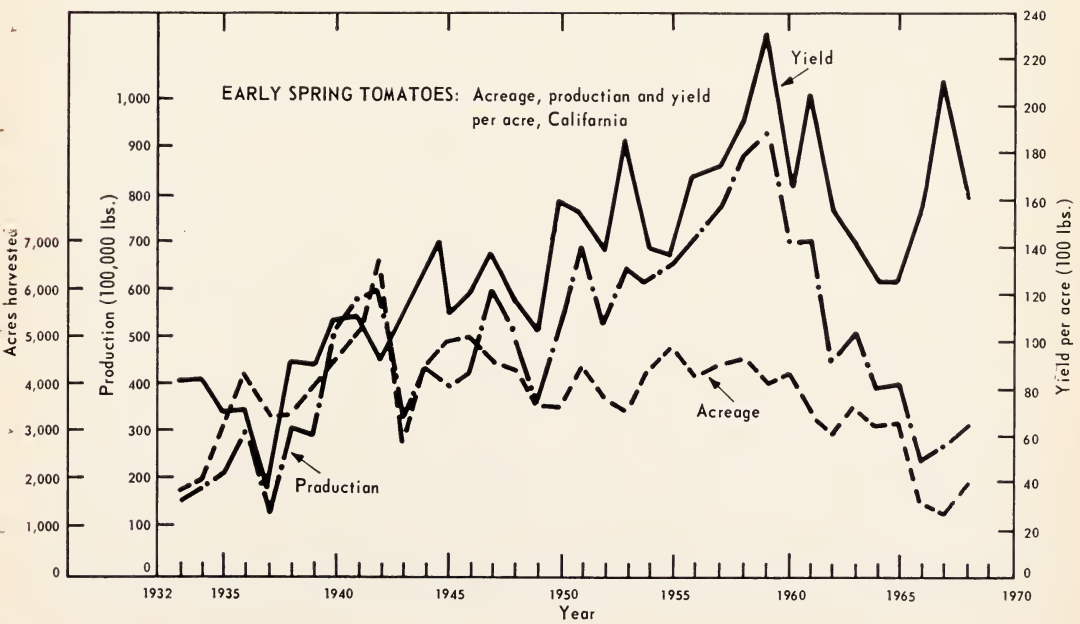
Early spring tomatoes are grown in the desert valleys of southern California under forced conditions to take advantage of the profitable early market. The main production area is Imperial Valley, where a mild climate allows early marketing and the possibility of extremely favorable prices. Coachella Valley tomatoes are marketed somewhat later, usually in May and early June. In addition, early production in San Diego County (Chula Vista and Otay Mesa), although considered part of the early summer crop, is marketed beginning in May. Although production is relatively expensive (grown on stakes, and with use of hormones), that district does have the advantage of frost-free coastal climate and

production has increased in recent years. The acreage of early spring tomatoes increased in the late 1930's and early 1940's. Acreage reached a peak in 1942 and was high again in 1943, but wartime labor shortages permitted harvest of only a portion of the crop and harvested acreage dropped sharply. After the war, plantings fluctuated around 4,000 acres. Competition from Mexico, which comes into production in midwinter (December to March) ahead of Imperial Valley, has resulted in reduced acreage since the mid-1950's. The increased production in Chula Vista and Otay Mesa has also affected marketing prospects in the late season. Yields of California early spring tomatoes trended strongly upward through 1959, principally because of improved varieties, higher plant populations, better cultural practices, and the concentration of production in the hands of experienced growers. Lower yields in the 1960's are thought to have resulted from a combination of factors, including unfavorable weather, soil diseases, and problems of management of new land. Fluctuations in yield are largely weather induced; for example, low yields in 1964 and 1965 were due to adverse (cool) weather during the growing season. Total production has generally followed trends and fluctuations in yield per acre but recent changes in acreage have also had their influence on total production.

Early summer tomatoes

There have been several important developments in total acreage and the relocation of acreage of early summer tomatoes in California. Acreage increased sharply in the late 1930's, dipped slightly during World War II, and reached a record high in 1946 in response to strong demands. Planted acreage continued high during the late 1940's, but a curly top epidemic in the San Joaquin Valley—particularly in 1949 and 1950—drastically reduced the harvested acreage. Fear of further losses held acreage down in 1951 through 1953. Acreage then rose sharply and has generally ranged from 12,000 to 14,000 acres since 1955. Major production areas are in Merced, Monterey, San Diego, San Joaquin, and Tulare counties.

There has been a major shift in acreage from southern California to the San Joaquin Valley. Urbanization, high land and water costs, and competition from other crops forced growers out of the Los Angeles-Orange County area. Some of the decline was offset by increases, first, in San

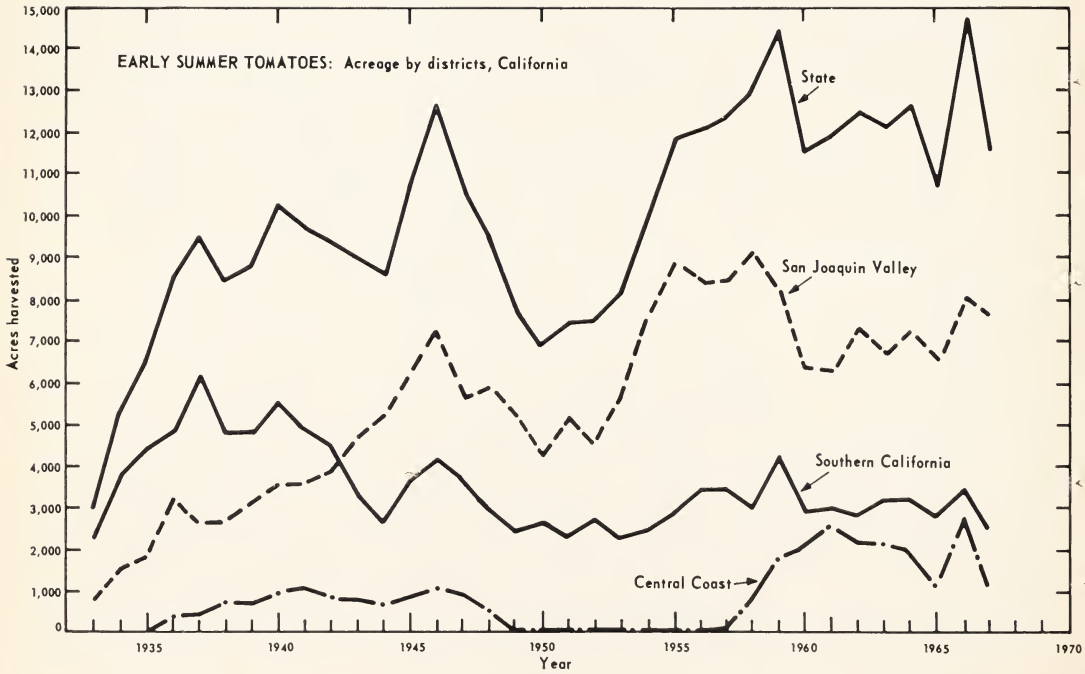


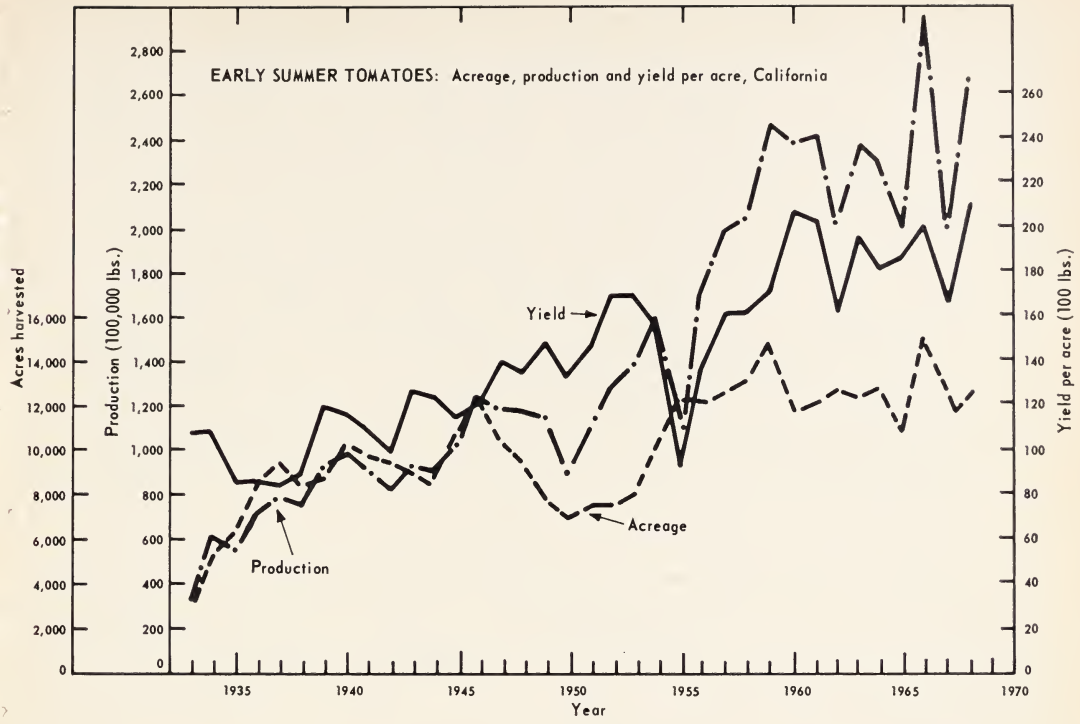
Diego County and in Ventura County in the 1960's. The big shift, however, has been north into the eastern Merced and Tulare counties where land and water costs are lower. Tomatoes in the Cutler-Orosi district of Tulare County are grown on stakes on the higher ground bordering the valley floor, where good air drainage maintains mild temperatures which permit early marketings. The increase in San Joaquin Valley acreage in 1955 was in eastern Fresno County, but that acreage shifted south to Tulare within a few years. The largest volume of early summer tomatoes, however, is produced in the Merced area. In about 1948, producers in the Merced area changed from growing tomatoes on stakes to growing them on the ground. They thereby sacrificed about 2 weeks in the early market but reduced investment and labor costs substantially. Since about 1954, early summer acreage increased considerably in the Los Banos area in western Merced County where the introduction of low-cost water encouraged production. The introduction of water to the west side of the San Joaquin Valley is expected to encourage some production in western Fresno, Kings, and Kern counties where harvesting is likely to be in June and July.

Yields of early summer tomatoes increased until 1954. Abnormal rainfall with intermittent frost periods at planting time in 1955 led to small, less desirable fruit, which found strong competition from increased production in competing states. As a result, harvested yields were low and fresh marketings were limited to Pacific Coast and nearby intermountain states. Heavy frost damage at the end of the 1956 season also resulted in relatively light yields. Since 1956, yields have generally been higher, although the 1962 crop was again affected by early frost damage and, subsequently, by hot weather which resulted in loss of bloom. With relatively stable acreages since 1955, total production has generally followed changes in yields per acre.

Early fall tomatoes

Marketing of early fall tomatoes in California involves high risk, depending on the date of the first frosts in the midwest and the east which end the tomato season there, and on the absence of early rains and cool weather in California production areas. Prices and acreage therefore vary widely from year to year, and postwar acre-

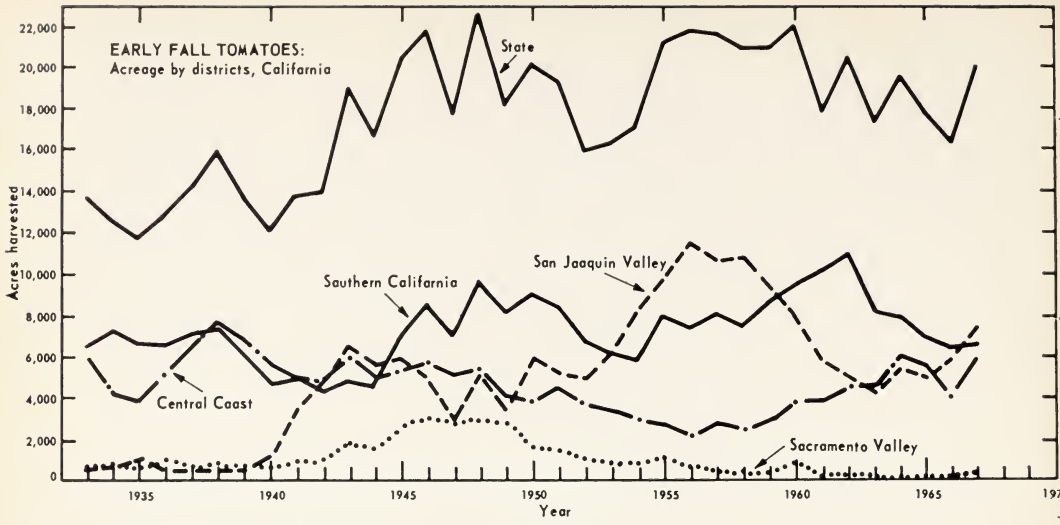


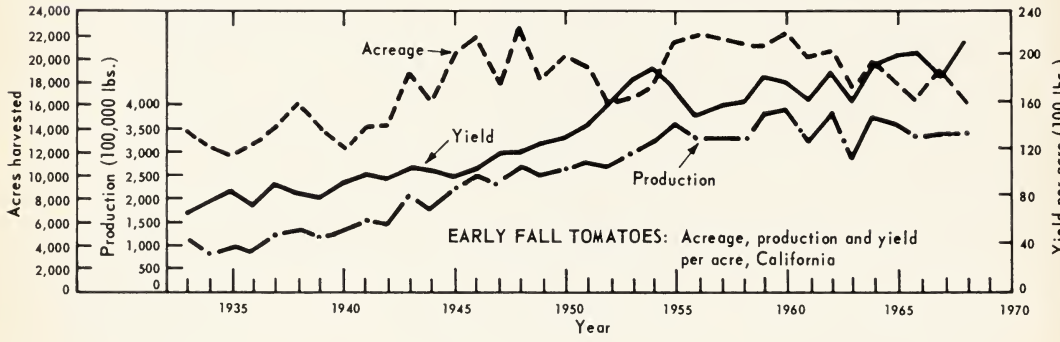


ages display wide fluctuations. When price is low, some production has been diverted to the processing market. Major producing areas are presently located in Monterey, San Diego, Stanislaus, San Joaquin, and Ventura counties.

There have been several important shifts in the location of acreage in the state—one major shift since World War II has been from the Sacramento Valley to the San Joaquin Valley. Low temperatures in the fall reduced the shipping quality of Sacramento Valley tomatoes and caused relocation of acreage farther south, mainly in the Stockton-Tracy-Patterson area in San Joaquin and Stanislaus counties. Decline of acreage in the San Joaquin Valley since 1958 is due to a shift of production from fresh to the processing market. The Central Coast valleys declined in importance from 1938 through 1956 because of urbanization and competition from alternative crops; however, there has been a recent rise in acreage in Monterey County. Southern California acreage has varied widely without any general trend; the immediate postwar rise and fall in acreage was due to changes largely in Santa Barbara County, whereas the increase from 1954 to 1962 was due to increases in San Diego and Ventura. Harvested acreages in these two counties have more recently declined. Any sizable future increases in acreage will probably take place in the San Joaquin Valley, where land is relatively more available and disease damage less likely.

Yields of California late fall tomatoes increased from the early 1930's through 1954. Yields have since been relatively stable. Shifts to better soils and climate, improved cultural practices, and concentration of production among efficient producers have contributed to yield increases. The low yield in 1956 was due to an unusually short marketing season resulting from prolonged mild fall weather in the east and midwest. This also caused low yields in 1961 and 1965, and production from substantial acreage was diverted to canners. The 1963 crop was affected by hot weather followed by early rains which reduced yields per acre. Changes in total production, therefore, have closely followed change in yield per acre.





PROCESSING TOMATOES

General description of the industry

Processing tomatoes are California's leading vegetable crop. Specialized and reliable production of high-quality fruit, a vigorous and viable canning industry, and successful grower adoption of yield-increasing and cost-reducing innovations have led to the concentration of U. S. production in California, despite the fact that processed tomatoes compete under a distinct freight disadvantage with tomatoes processed in eastern areas. These factors have resulted in California's share of the national production of processing tomatoes increasing from a postwar average of only 22 per cent to one-half of U. S. production in 1951 and two-thirds in 1964 and 1966. Recent developments, largely resulting from successful mechanization and favorable prices in processing contracts for 1967 and 1968, now result in California producing 80 to 85 per cent of total U. S.

production. Most of the processing tomatoes in California are grown on direct contract with the processor; thus, the contract price, determined before planting, becomes the effective selling price. Prices offered by canners are heavily influenced by carry-over and prospective demands.

Mechanized growing and harvesting of processing tomatoes have been the key to the expansion of production. University of California research of more than a decade led to both the cultural and mechanical capability for machine harvesting in the early 1960's. In 1961, two prototype machines were field tested. From 1963 to 1965 the number of machines increased from 30 to 250, and the share of harvested acreage rose from 1.3 to about 17 per cent. The three following years have seen rapid adoption of machine harvesters by growers. In 1966, machines harvested two-thirds of the state's acreage; in 1967 upwards of 80 per cent; and in 1968, nearly 95 per cent of total acreage is estimated to have been harvested by about 1,300 machines.

Changes in acreage and location of production

Large fluctuations in acreage, due mainly to grower response to processor prices, characterize the historical picture of California tomato production. The acreage of processing tomatoes in California increased fivefold from 1933 through 1947 in response to generally favorable prices to producers, and to sharp increases in defense demands. Acreage dips during the war were primarily the result of labor shortages and low relative prices. Slackening in postwar demand led to large carryovers and reduced prices, forcing acreage down from 1948 to 1950. A sharp acreage jump in 1951 reflects Korean War demand; much acreage was planted again in 1952, but not all was harvested. These peaks in acreage and production were followed by several years of lower acreages as canners adjusted contracts to inventories. In 1956, however, acreage and production rebounded to record peaks. Fluctuations since 1956 are generally in response to price, although threats of labor shortages served also to dampen harvested acreage in 1963 through 1965 as growers cautiously awaited the outcome of early efforts to mechanize tomato harvesting. The sharp increase in acreage since 1965 reflects high processor prices due to low inventory levels resulting from the 1963-1965 curtailment, and to the favorable grower response to mechanization.

Processing tomato acreage increased sharply in three areas during World War II: the Sacramento Valley, the San Joaquin Valley, and the Central Coast area. Since the war, the Central Valley has had the most acreage. Urbanization in the San Francisco Bay area was important in the postwar reduction in acreage in the Central Coast. The four conterminous counties—San Joaquin, Yolo, Solano, and Sacramento—have traditionally accounted for the majority of total state acreage. The recent rise in San Joaquin Valley acreage is due to large increases in Fresno and Kern counties. Acreage in Fresno county rose from 2,470 acres in 1965 to 15,830 in 1967. Despite the increase in the south San Joaquin Valley, acreage in the traditional area is not expected to decline because that area produces more desirable canning fruit (higher solids) preferred by canners for making concentrated tomato products (e.g., catsup, paste, and sauce). Within the Sacramento Valley, acreage is increasing rapidly in the Sutter basin. Southern California has never been an important segment of the state industry, but there is a possibility that production of processing tomatoes can be successfully introduced into its desert areas.

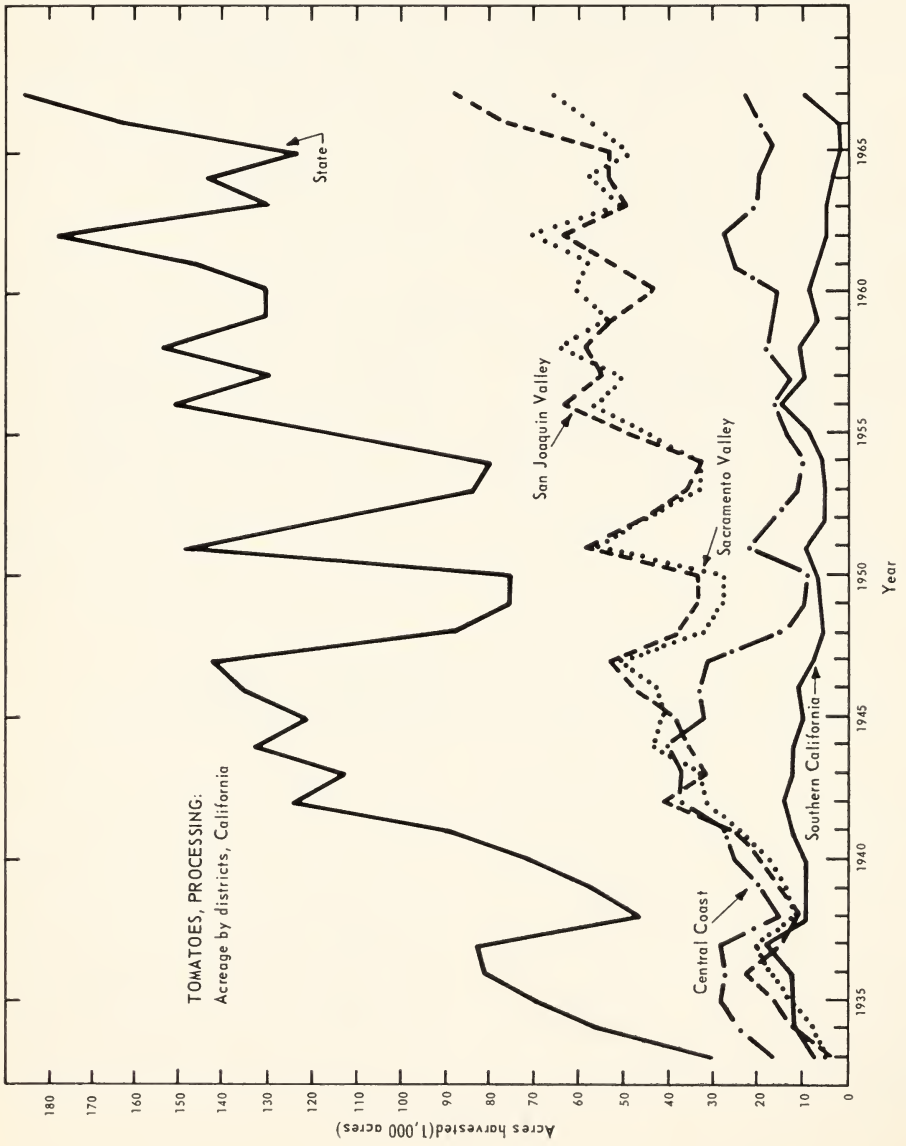
Trends in yields and production

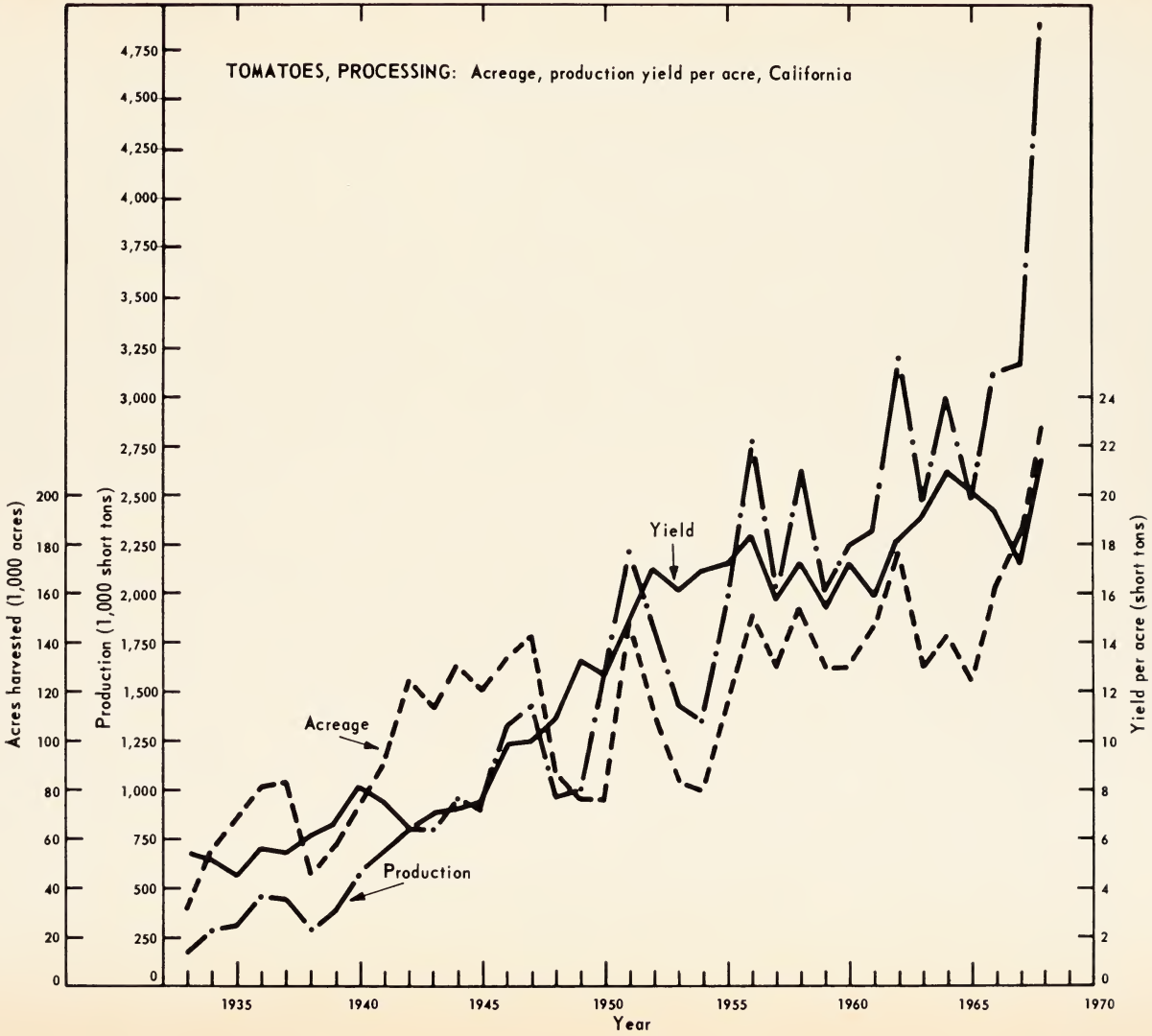
Yields of processing tomatoes have increased relatively rapidly and steadily through the early 1950's due, mainly, to adoption of the Pearson or Pearson-type tomato about 1942. Producers switched to Pearsons mainly because packers preferred the smaller tomato. Several other developments also contributed to the rise: tomato plants were spaced more closely, which increased the percentage of fruit that set early and therefore minimized the risk of losses from late season rains; greater areas of land were leveled, allowing better irri-

gation and more uniform yields over the field; and heavy rates of fertilizer were applied. As a consequence, yields in the 1950's were double those attained in the early 1940's. Yields per acre changed little during the 1950's.

The adoption of mechanized harvesting necessitated the genetic design of a new fruit for the industry. The basic requirements were a small determinate plant with a concentrated fruit set, good disease resistance, and small, firm fruit of desirable processing quality. In response the University of California released a new variety in 1961, the VF-145, which now constitutes 85 to 90 per cent of state acreage. Although yields rose through 1964 they have more recently declined due, in part, to new growers in expanding production areas of the state. Yields are therefore expected to increase above present levels as growers become more experienced.

Production of processed tomatoes has increased California's share of a rising national production. Acreage increases accounted for early rises in production, but yield increases were the chief contribution from 1947 through the early 1950's. More recently, changes in acreage have again importantly affected total production.




TOMATOES, PROCESSING: Acreage, production yield per acre, California
Acres harvested (1,000 acres)
Production (1,000 short tons)
Yield per acre (short tons)
Year
Acreage
Production
Yield
0
20
40
60
80
100
120
140
160
180
200
0
250
500
750
1,000
1,250
1,500
1,750
2,000
2,250
2,500
2,750
3,000
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4
6
8
10
12
14
16
18
20
22
24
1935
1940
1945
1950
1955
1960
1965
1970

ALFALFA HAY

General description of the industry

Hay occupies a greater acreage of California land than any other single crop (about 1.9 million acres) and alfalfa hay makes up about two-thirds of total hay acreage in the state. It is second only to barley in terms of total acreage among field crops, accounting for about 18 per cent (ca. 1.2 million acres) of total field crop acreage. Alfalfa is grown commercially in almost every county. In California, alfalfa is mainly an irrigated crop, using three to six acre-feet of water per season, depending on efficiency of use, soil, temperature, length of growing season, and other factors. Selected public and private varieties are adapted to a wide range of soils and climates. Vernal and varieties of similar winter dormancy have proved superior in the northern part of the state; Lahontan and similar varieties are predominant in the Sacramento Valley; and Moapa, Sonora, El Unico, and similar varieties are grown in the San Joaquin Valley. The lower desert valleys of southern California are planted with Mesa Sirsa, Sonora, El Unico, and similar varieties. In general, there has been a marked trend from public to private varieties for hay production throughout the state.

A substantial proportion of the alfalfa hay grown in California is produced as a cash crop for shipment to dairy-producing and livestock feeding centers in the state. Dairies on the north coast (Petaluma) use substantial quantities produced in the Sacramento and northern San Joaquin Valleys. The Los Angeles drylot dairy industry draws heavy shipments of alfalfa from Imperial Valley, the Mojave desert area, and the southern San Joaquin Valley. Cattle feeding operations in the Imperial and Palo Verde valleys also utilize large tonnages of alfalfa hay. Despite production levels in excess of six million tons in recent years, California imports some quantities of alfalfa hay (mostly from Arizona and Nevada) for cattle feeding and dairying operations in San Bernardino, Riverside, Imperial, and Los Angeles counties; for dairies in the Sonoma, Marin, and the San Jose milkshed areas; and for alfalfa milling operations in Sacramento County.

Not all of California's alfalfa hay production is utilized in the form of hay. There is significant demand, both domestically and foreign, for alfalfa meal (pellets) and one and one-fourth inch alfalfa hay cubes. The development of pellet and cube markets has had a stabilizing effect on hay prices. California produces a higher quality dehydrated alfalfa meal than does any other area, and it has wide usage in rations for poultry, hogs, and cattle; production has increased from less than 400,000 tons in 1963 to 564,000 tons in 1967. Exports of pelleted alfalfa meal amounted to 315,000 tons in 1967 compared to only 156,000 tons in 1962. Nearly all of the exports are to Japan. Alfalfa cube production is estimated at 300,000 tons or about 5 per cent of the alfalfa crop in 1967. This was three times the estimated production for 1965. The sharp increase in production is due to demands arising from more efficient utilization in feeding and to reduced labor, shipping, and storage costs resulting from bulk handling. A large proportion of production is consumed by Petaluma area dairies, although an estimated 10,000 to 15,000 tons were shipped from California ports to Hawaii in 1967.

Changes in acreage and location of production

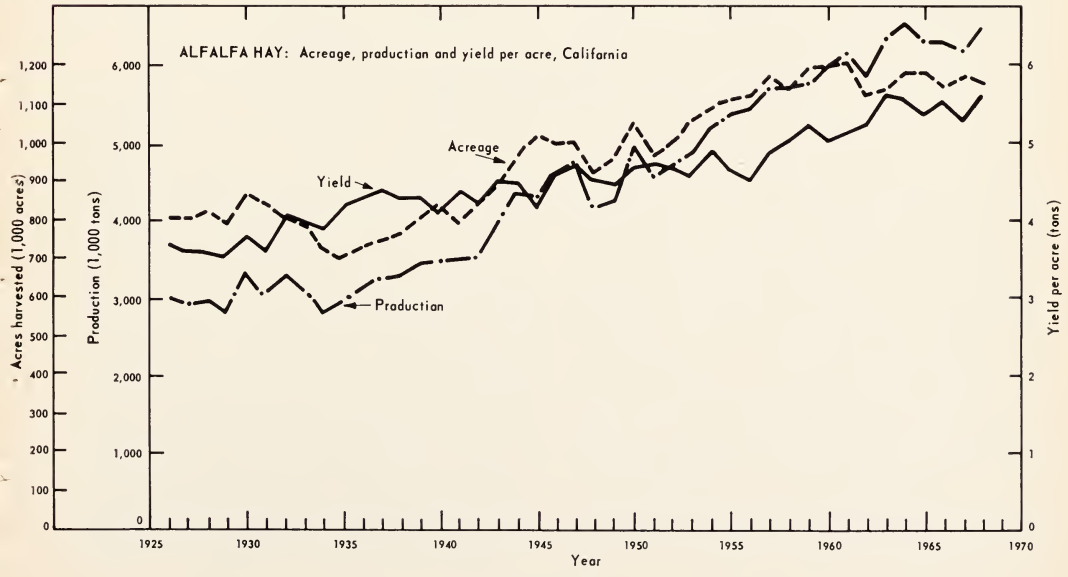
Alfalfa acreage in California has generally increased since the mid-1930's. The increase has been tied closely to expansion of the livestock industry in California, par-

ticularly in the dairy industry. Acreage since 1950 has been influenced by cotton acreage allotments.

County data by years are not available, but the major alfalfa-producing districts have not changed in order of importance since 1930: the San Joaquin Valley, southern California, and the Sacramento Valley. Production within these areas is possible almost anywhere that irrigation water is available. The Imperial Valley, however, has the greatest single concentration of acreage. Advantages there are: nearness of the southern California dairy and beef feedlot markets, and the importance of alfalfa as a cash crop in rotation with commercial vegetables and cotton. The most recent county data for California (1964) identifies nearly 60 per cent of alfalfa hay production to be located in the San Joaquin Valley where all eight counties had significant production (in excess of 200,000 tons)—Kern, Tulare, and Fresno each produced more than 600,000 tons. Southern California accounts for about 25 per cent of production with significant production in Riverside and Los Angeles counties in addition to that in Imperial. About 10 per cent of production is in the Sacramento Valley (Yolo County—a significant production area), and the Central Coast and northern mountain regions each accounted for 3 to 4 per cent.

Trends in yields and production

Alfalfa yields have generally increased since the late 1920's. Yields over the state vary from 2 to 12 tons per acre, depending on length of growing season, weather, soil conditions, and water supplies. Higher yields occur in the San Joaquin Valley and southern California where more cuttings are possible per season. The gradual average yield increases in the state are probably accounted for by improved varieties, fertilization, and dusting and spray programs. Yield fluctuations are due to insect damage (e.g., alfalfa aphids, army worms, etc.) and to weather conditions. For example, early April rains in 1965 and 1967 reduced yields, as did a peak infestation of army worms in the latter year. In contrast, favorable late fall weather in both 1966 and 1968 permitted an extra cutting of hay in most areas and contributed to higher yields. Total production has trended strongly upward in response to strong demand, closely following the state-wide increased acreage and yields.



ALFALFA SEED

General description of the industry

California is the major alfalfa seed producing state, yet the alfalfa seed industry in California has largely developed since World War II. Prior to 1946, alfalfa seed production in California varied between 2½ and 5 million pounds annually. Sharp increases beginning in 1949 resulted in achievement of production levels averaging more than 80 million pounds in 1955–1957—nearly half the U.S. total. More recently, production has stabilized around 45 million pounds and amounts to 35 to 40 per cent of the U.S. total; Idaho, Washington, and Oregon together produce another third, and the remainder is distributed among other western and midwestern states.

The development of the industry in the late 1940's and early 1950's was due to the recognition that seed could be produced in California and exported for planting in other areas and climates. Imported foundation seed provided the basis for commercial seed production, and California producers proved that they could reliably provide high-quality seed for buyers in other areas. Although California produces nearly 40 per cent of the alfalfa seed in the U.S., it accounts for less than 10 per cent of hay acreage. The north central states are the dominant hay producing states in the U.S. with 60 per cent of total alfalfa hay acreage, and are thus the chief export market for California-produced alfalfa seed. Early seed production was primarily that of certified public varieties (Ranger was the first important variety for California producers). However, there are definite trends in the seed industry which have resulted in increasing demands for both certified and noncertified private varieties. For example, two-thirds of total seed production was of certified public varieties in 1960, but only one-third in 1967. In contrast, private varieties increased from 11 to 41 per cent over the same period.

Changes in acreage and location of production

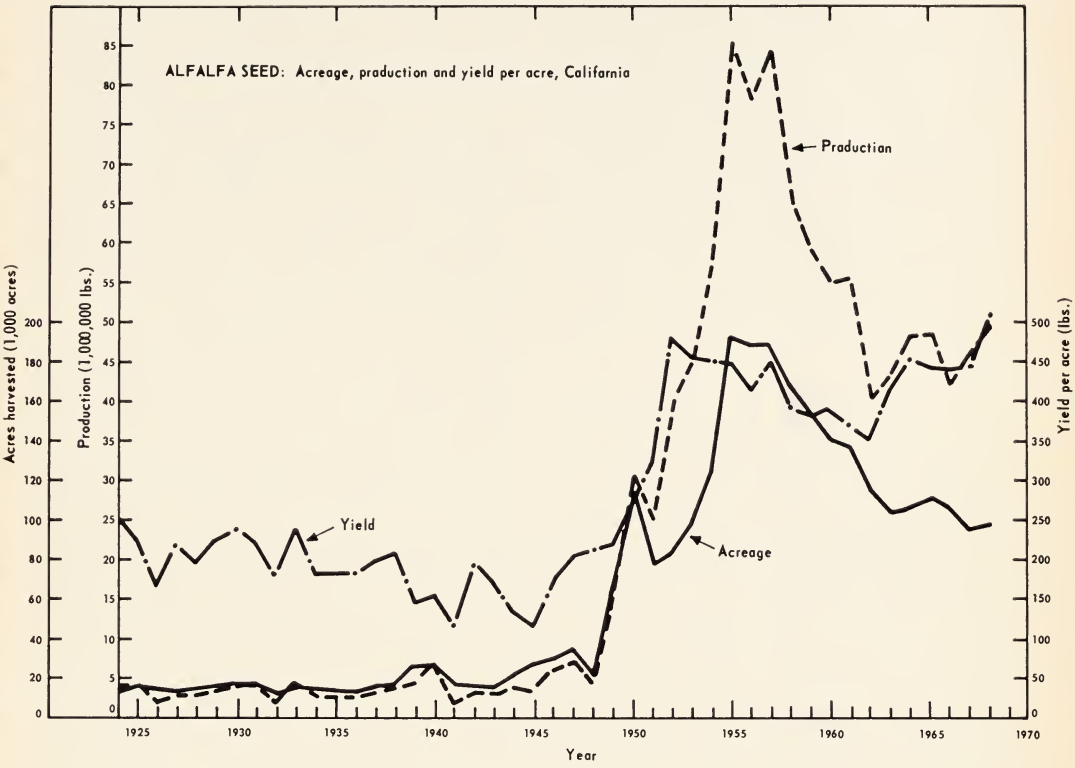
Prior to 1949, alfalfa seed acreages in California generally ranged from 15,000 to 30,000 acres. The response to the emerging export market for California-produced seed led to sharp increases—from 21,000 acres in 1948 to a peak of 192,000 acres in 1955. Acreages have declined since the peak and now appear to be stabilizing at about 100,000 acres. Part of the decline is due to the later development of the seed industry in the Pacific Northwest where more effective pollinators (wild bees, etc.) are present, part is due to adjustment to general overproduction in the late 1950's, and part to the decline in planted acres of alfalfa hay as continual-rotation corn was adopted in the north central states.

Annual data are not available by county, but the 1964 Census indicates that about two-thirds of acreage and three-fourths of production is located in the San Joaquin Valley. Fresno, Imperial, and Kern counties are major production areas, but some commercial production can be found in almost every interior valley county.

Trends in yields and production

Alfalfa seed yield data show two periods of significantly different yield levels. Through the late 1940's, yields averaged about 200 pounds per acre with large annual fluctuations and a slight downward trend. In contrast, sharp yield increases resulted in the attainment of yields in excess of 400 pounds per acre by the early 1950's. The change from casual seed production on old alfalfa fields in the earlier period to the commercial production of the 1950's, with awareness of pests and pollination considerations and generally improved cultural programs, underlie the higher yield levels. Overproduction and low price problems in the late 1950's are evident in the decrease in yields from the 1952 high, but yields

have increased in the 1960's, with stabilization of acreage among experienced, knowledgeable growers. Total production has increased almost tenfold to the more stabilized levels characteristic of industry in recent years. Both acreage and yields have importantly affected the total production of alfalfa seed throughout this period.



BARLEY

General description of the industry

Over 20 per cent of the acreage devoted to field crops in California is used for barley production. California's production is about one-sixth of total U.S. production and ranks second only to North Dakota nationally. Most of the California crop goes to livestock feeding and feed manufacturing industries, whereas a high proportion of midwest barley goes into brewing use. In general, breweries require a barley of proper variety, bright in color, plump and mellow, and with high germination. Parts of California are particularly well adapted to the production of high-quality malting barley (the western Sacramento Valley, the eastern side of the northern San Joaquin Valley, and the Tulelake district). However, the once sizable market for malting barley has been displaced by imports of midwestern barley (which has a difference in flavor when used as a malt) as a consequence of the expansion of midwestern breweries to the west coast and the

elimination of many local west coast brewers. Some midwestern-type two-row malting barley is produced in the Tulelake area.

Barley, the leading cereal crop in California, has been able to outyield wheat, its chief competitor, in most areas. However, there has recently been a shift from barley to Mexican wheat (considered up to now a feed variety) in both irrigated and dry-land production areas. Future production of barley in California may be importantly affected by the possibility of increasing production of Mexican wheat which can produce higher yields. The extent of this possible shift in cereal production depends on acceptability by the feed industry of wheat as a replacement for barley.

Barley acreage and production in California reached a peak just before World War I as a result of high premiums for California barley because of its exceptional malting qualities—at that time, barley occupied large acreages in the Sacramento and San Joaquin valleys. After World War I, expansion of irrigation in the Central Valley brought a shift from barley to higher income crops. This development, along with Prohibition, depressed barley acreage during the 1920's. Acreage and production rose during the 1930's and later, as Prohibition ended and as farmers recognized that barley was a useful rotation crop for breaking disease and pest cycles. In recent years, barley has increased in irrigated areas when higher income crops (such as cotton) were limited by acreage restrictions, or when water was insufficient for other crops.

Changes in acreage and location of production

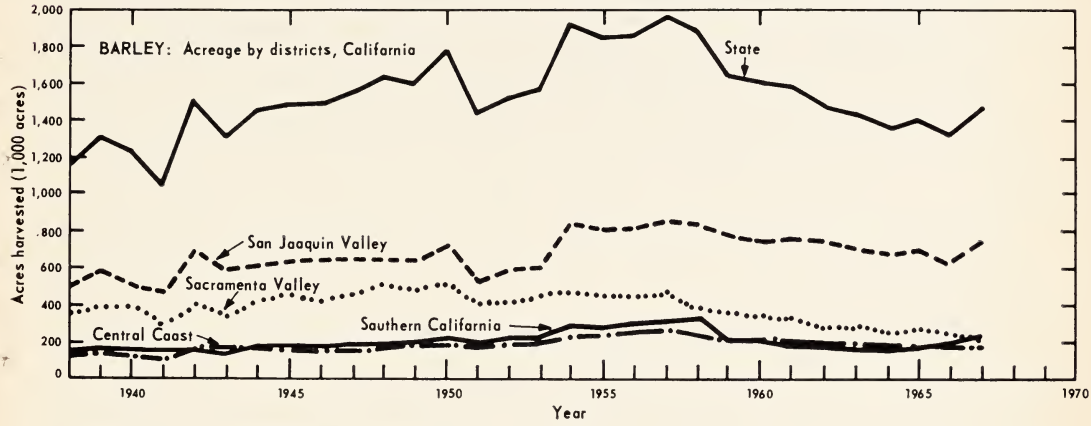
Barley acreage is distributed widely over the state. The San Joaquin Valley accounts for one-half of total acreage in California; Fresno and Kings counties are by far the most dominant production areas with nearly 350,000 of the state's 1.3 million acres in 1966. Other major counties, with more than 50,000 acres in 1965 or 1966, are Kern, San Joaquin, and Tulare (San Joaquin Valley); Yolo, Glenn, and Colusa (Sacramento Valley); Monterey and San Luis Obispo (Central Coast); and Imperial and Riverside (southern California). The San Joaquin Valley apparently supplanted the Sacramento Valley as the major barley area as emphasis shifted from malt barley to feed barley. The effect of cotton acreage allotments on barley acreage is clearly shown. Barley acreage in the San Joaquin Valley increased in the cotton allotment years (1950, and 1954 to date) because many cotton-growing acres were diverted to barley. Removal of cotton allotments in 1951–1953 depressed barley acreage sharply. The introduction of safflower in the Sacramento Valley, with major acreages devoted to the new crop in the late 1950's, reduced barley acreage as did increases in rice allotments for the 1966 and 1967 crops. Increases in Mexican wheat probably also contributed to reductions in barley acreage since the mid-1960's. The decreased acreage noted in southern California in the late 1950's probably represents total acres of land going out of agricultural production. Increased cotton production in the Imperial Valley in the mid-1950's reduced barley acreage. However, barley acreage recently increased because of reductions of cotton acreage resulting from pink bollworm infestation (and the absence of proved control programs) in 1966 and 1967.

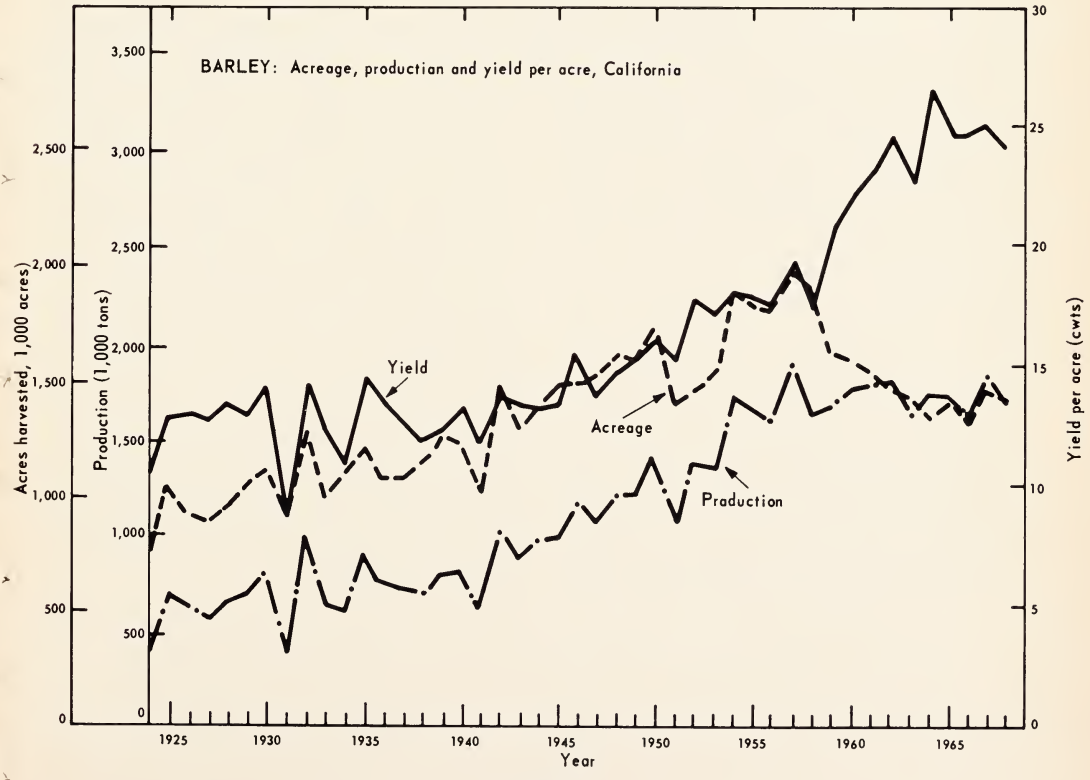
Trends in yields and production

Barley yields show no increase through the 1940's, with year-to-year fluctuations in yields reflecting changes in weather (particularly rainfall) on the dominant dry-land production of that time. Subsequent greater yields are due to increased fertilizer rates, use of herbicides, and increases in irrigated acreage. The shift of acreage from dry land to irrigated land is taken to be the major factor behind increasing barley yields. Dry-land acreage removed from production on the east side of the San Joaquin Valley and in Riverside and San Diego counties paralleled increased yields. Most of the barley grown from Stockton south (hence, most of the San Joaquin Valley) is pre-irrigated, and barley on the west side

of the Valley may have one to three water applications. Imperial Valley production is also irrigated. The decrease in year-to-year yield fluctuations is due to increased irrigation and increased use of fertilizers, even under dry-land farming conditions. Very little of the past yield increase is thought to be due to shifts in barley varieties, but new varieties from the University of California, including hybrid barley varieties, may increase future yields. Prospects of the development of systemic fungicides to control foliar disease problems could also contribute to yield advances, as could the development of lodging resistant varieties capable of sustaining higher yields under irrigated conditions.

Barley production increased with increases in acreage through 1957, and fluctuations in production were closely associated with changes in acreage. Production has been relatively stable since 1957 despite acreage reductions due to the impact of increasing yields per acre noted above.





DRY BEANS

General description of the industry

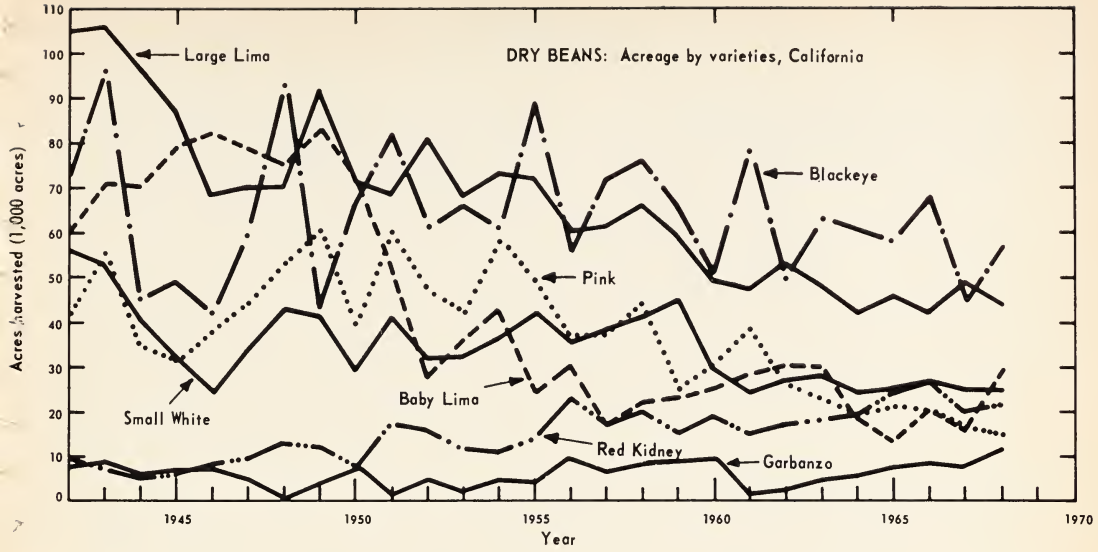
California, consistently the second ranking bean producer behind Michigan, is also the only producer of several important market types of beans. For example, California produces all of the national production of large lima, baby lima, and garbanzo beans. California production (average 1965–1967) also accounts for 98 per cent of small white, 51 per cent of pink, and 21 per cent of red kidney bean production in the United States. In addition, California produces about one-half of the national production of blackeye beans. Other minor market types also produced in California include flat white, cranberry, and small red.

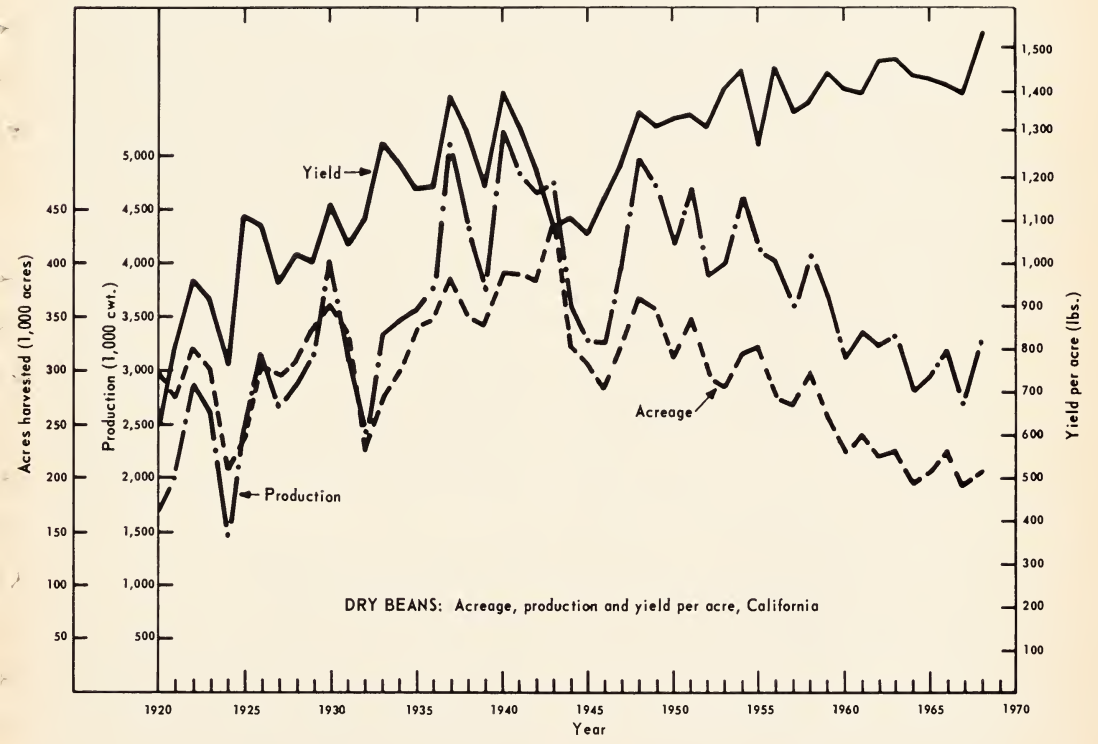
California's bean acreage is located in the interior and coastal valleys. Beans fit well into the state's cropping systems because they are well suited to mechanization and have yields generally higher than in the rest of the U.S. Annual county data are not available, but the 1964 census indicates the following counties to have 10,000 acres or more: Stanislaus (26.9 thousand), Monterey (22.8), San Joaquin (16.7), Santa Barbara (16.2), Kern (11.4), and Sutter (10.6). By production regions the percentage of state acreage and other significant counties are: San Joaquin Valley, 44 per cent—Fresno, Tulare, and Merced; Sacramento Valley, 20 per cent—Butte, Yolo, and Colusa; southern California, 20 per cent—Ventura and Orange; and Central Coast, 17 per cent—San Luis Obispo.

Blackeyes are considered a dry bean in California because the crop is grown with the same practices used for other beans and handled in the trade as a bean, although it is a variety of the cowpea. Blackeyes withstand more heat than other beans. Production is concentrated in the San Joaquin Valley (95 per cent) with minor acreage in the northern Sacramento Valley and in the interior valleys of southern California. Since 1955, acreage in blackeyes has generally surpassed that of any other single type in California.

Large lima production is concentrated in the coastal valleys from Santa Maria to San Diego—an area accounting for about two-thirds of production. Additional production comes from Monterey and Stanislaus counties. Because of the high market price for large limas, production has frequently been extended to less well-suited areas. *Baby limas,* in contrast, are extremely hardy. Production is shared almost equally among the San Joaquin and Sacramento valleys, where it is concentrated in the irrigated districts on the west side of the northern San Joaquin Valley (Stanislaus and San Joaquin counties) and in the Sutter Basin.

Small white beans are used primarily for baking (pork and beans). Production is concentrated in the Central Coast region, particularly in the Salinas Valley. *Red kidney* beans are grown in the Central Valley of California. Production is usually in the river-bottom land of the tributaries of the Sacramento and San Joaquin rivers. About two-thirds of the production is in the San Joaquin Valley; the remainder is in the Sacramento Valley. California also produces disease-free seed for the sizable production of red kidney beans outside the state (especially New York). *Pink* beans are grown mainly in the Sacramento Valley, mostly in Sutter, Yolo, and Solano counties. Pinks find their final use in domestic demands, mostly in the west and in Latin American export demands. *Garbanzo* beans are produced in southern California where production is limited to the cool coastal areas.


DRY BEANS: Acreage by varieties, California
Large Lima
Blackeye
Pink
Small White
Baby Lima
Red Kidney
Garbanzo
Acres harvested (1,000 acres)
Year


Yield
Production
Acreage
DRY BEANS: Acreage, production and yield per acre, California
Acres harvested (1,000 acres)
Production (1,000 cwt.)
Yield per acre (lbs.)
Year

CORN

General description of the industry

California is a minor corn-producing state with acreage and production amounting to only about one-half of one per cent of national production. Corn was one of the first crops introduced into the state, but varietal considerations made it poorly adapted to much of California. Prior to 1954, corn was almost exclusively produced in the Delta area of the Sacramento and San Joaquin valleys (in Sacramento, Yolo, Solano, San Joaquin, and Contra Costa counties) where low water costs, low fertilization requirements of peat soils, and cooler climates proved conducive to profitable corn production. The sharp expansion of corn acreage from 1953 to 1957 extended production to the better mineral soils of the San Joaquin Valley; here, corn was introduced on former cotton acreages made available because of acreage restrictions. This expansion coincided with favorable corn prices and such major technical developments as: development of double-cross hybrids suitable to the expanded area; improved cultural programs, including better fertilization, irrigation, and agricultural chemical practices; machinery innovations, such as the corn combine; and more widespread knowledge and experience among formerly inexperienced growers. By 1962, however, state corn acreage had declined sharply to about former levels, with concentration in the Delta due to lower corn prices and poor preharvest conditions (resulting in root rot and stalk breakage) in the San Joaquin Valley. The increase in sugar beet acreage in the San Joaquin was related to the drop-off of corn acreage, and melons and several other crops proved more profitable in the face of declining corn prices.

An improvement in price and additional technological developments brought about a second expansion in acreage beginning in 1963. New single-cross hybrid corn varieties with higher yield capability were successfully introduced, and better fertilization and control programs for insects (mites) and weeds were adopted. In addition, increased demands for corn for food consumption spurred acreage increases in the lower San Joaquin Valley (mainly in Madera, Merced, Fresno, and Tulare counties). Both white and yellow corn are produced, with emphasis on the former, for use in a variety of cornmeal products. Corn produced on a contract basis is restricted to the San Joaquin Valley because of varietal considerations which demand a long growing season and which make corn an unsuitable crop for the Delta, its traditional production area.

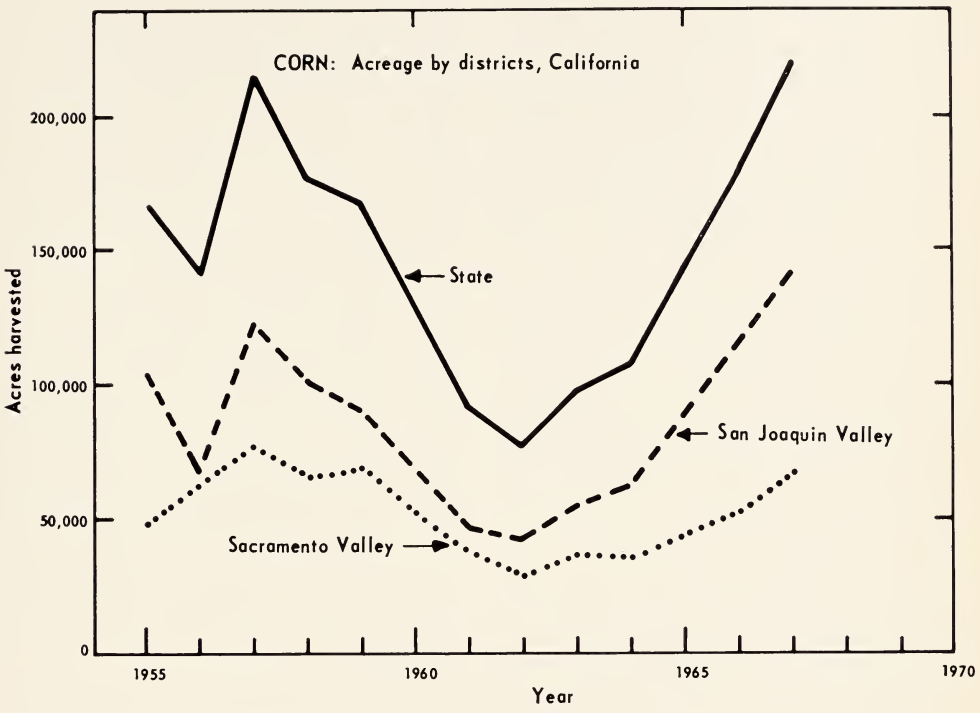
Changes in acreage and location of production

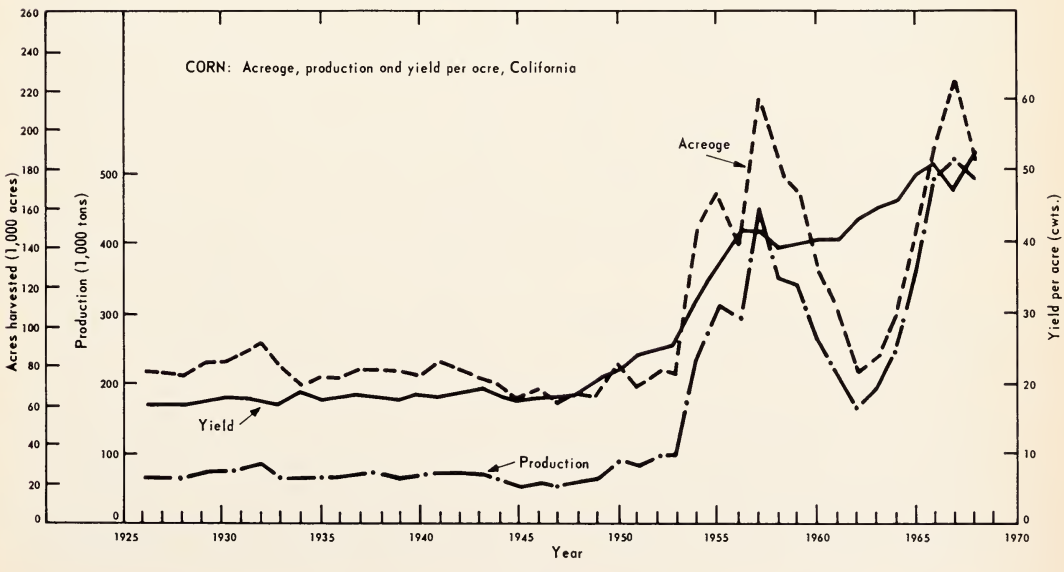
In addition to the traditional concentration of acreage in Delta counties, corn is produced throughout the San Joaquin Valley and in minor amounts in the basin (low water-cost) areas of Glenn, Sutter, and Butte counties in the Sacramento Valley. With the exception of the Delta area of Contra Costa County and some acreage in Monterey County, there are no significant production areas outside of the Central Valley. It is evident that corn production in California (outside of the Delta and the specialized white corn industry) is very sensitive to the level of corn prices determined largely in the midwest, and to effects of the cotton program as well as to changing profitabilities of other crops competing for land.

Trends in yields and production

The yield data exhibit two periods of stable yields (1926–1948 and 1956–1961), each followed by yield increases. The introduction of hybrid corn varieties about 1948 with the inflow of technology and grower interest (triggered, in part, by favorable prices) resulted in doubling the state-wide yield from 1 to 2 tons per acre from 1948 to 1956. Thereafter yields remained stable through 1961 as acreage retrenched to the Delta, but better manage-

ment practices left their effect on the previously traditionally minded growers in that area. The increase in yields since 1961 is attributed to the new single-cross varieties and better fertilization. The statewide yield is now in excess of 2.5 tons per acre, with several counties reporting average yields of over 3 tons and attainable yields under favorable conditions of 4 to 6 tons per acre. Throughout the period studied, changes in production have been mainly associated with changes in acreage. Total corn production is now nearly six times the 1950–1953 level.





COTTON

General description of the industry

The U.S. has been regarded as the dominant cotton-producing country of the world. In the 1920's, it accounted for about half of world acreage and slightly over half of world production; by the mid-1950's, it accounted for only about one-fifth of world acreage but over one-third of world production. However, in 1966–1967, as the result of voluntary governmental programs to divert cotton acreage, the U.S. had only about 12 per cent of world acreage and less than 20 per cent of world production.

These large reductions in U.S. acreage have been accompanied by sharp yield increases, with production maintained at relatively high levels. Important shifts have also taken place in cotton-growing areas of the U.S. The irrigated west (mainly California, Arizona, and New Mexico) produced about 2 per cent of the U.S. total in the 1920's compared with more than 20 per cent today. The Mississippi Delta areas and the high plains and lower Rio Grande Valley of Texas, also increased in relative importance, while the traditional cotton areas of the southwest and southeast have decreased. Relatively high yields and mechanization of the crop have favored expansion in the west. California is the third ranking state in production (following Texas and Mississippi) and cotton is generally the leading income crop in California. The growers have the advantage of producing high-quality, longer-staple upland cotton ($1\frac{1}{16}$ inches or longer). The industry in the San Joaquin Valley is unique in that, by law, only the Acala variety has been grown since 1925.

Changes in acreage and location of production

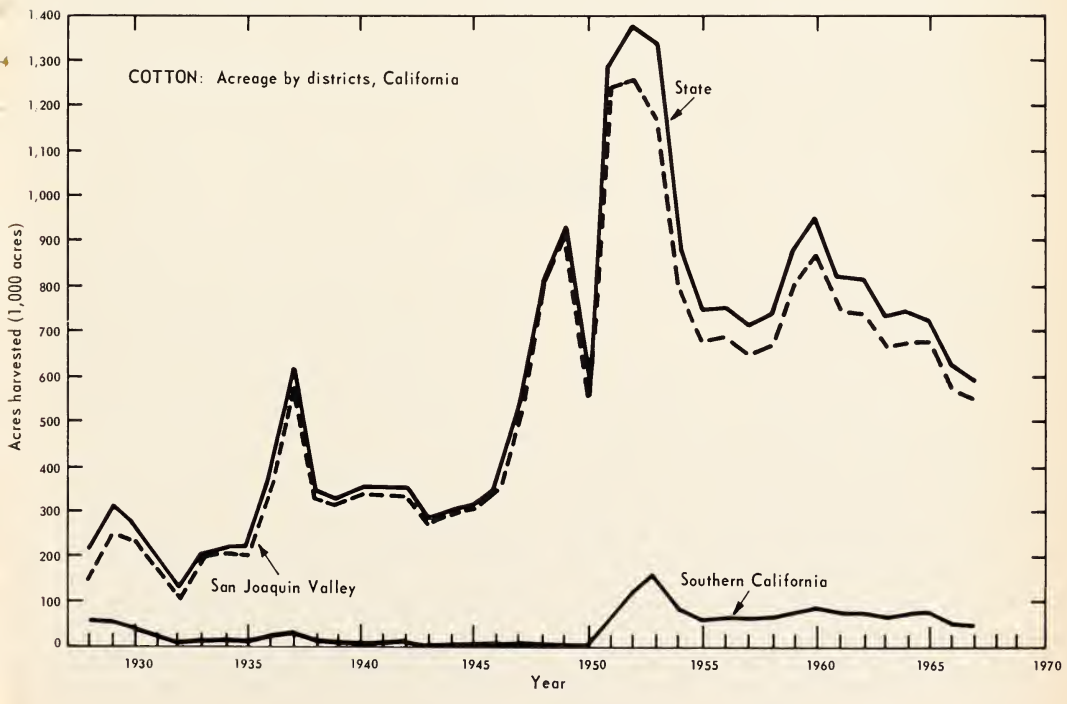
Commercial cotton production in California was first established in the Imperial Valley after 1910 but later it was concentrated in the southern portion of the San Joaquin Valley. High prices in the mid-1930's apparently induced acreage expansion, with peak acreage in 1937; grower compliance with the cotton program reduced acreage in 1938. Acreage was static from 1938 through World War II because expansion was restricted by price ceilings, shortages of harvest labor, and the relatively high priority of other crops. Acreage increased sharply immediately after the war. Curtailment of foreign production and high domestic support prices led to major development of irrigated cotton land in California between 1945 and 1949, and acreage increased threefold during that period. In 1950 acreage was restricted by allotment, but it increased sharply in the next 3 years in response to Korean War demands. The rapid postwar expansion in acreage partly reflected increased profitability resulting from machine picking—virtually all of the California cotton crop is machine harvested. Acreage allotments were again imposed on the 1954 crop as domestic inventories and production were in excess of demands. Allotments and other governmental programs for cotton have been in effect since 1954. Except for permitted expansion in 1959 and 1960, cotton acreages have generally declined throughout the period.

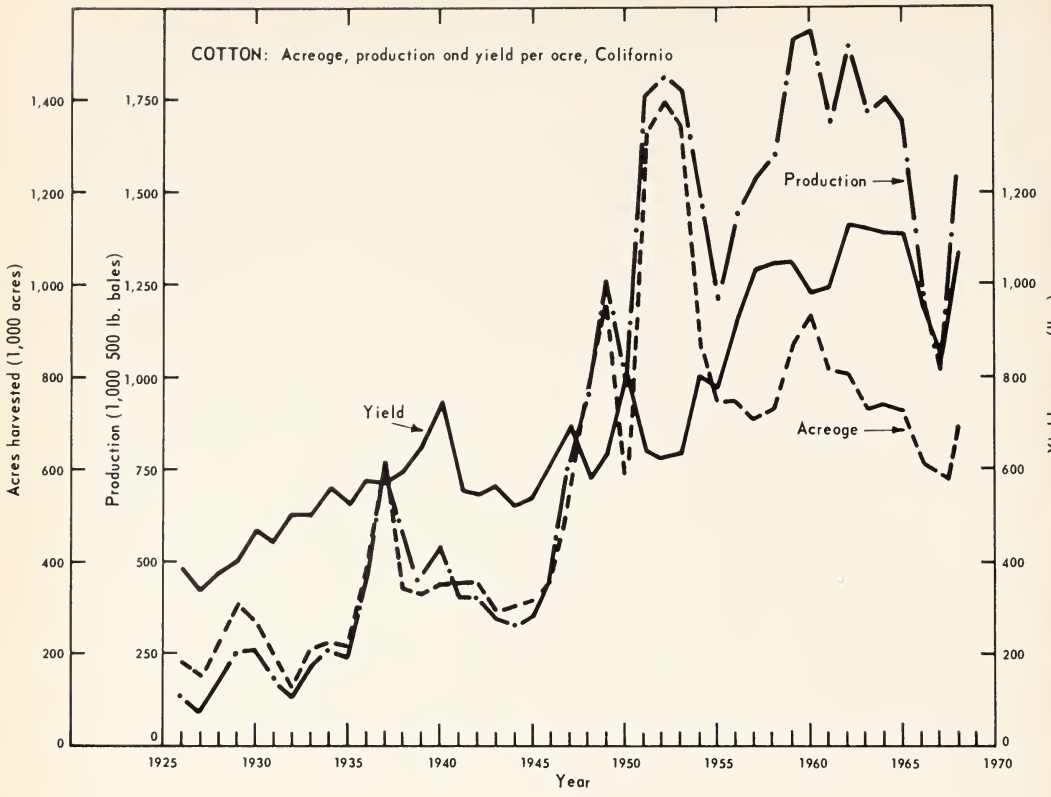
Although cotton production was first introduced in the Imperial Valley in the early 1900's, the high incidence of injurious insects adversely affected production there. In addition, competition from vegetables and other crops, and the development of a cotton variety well adapted to the San Joaquin Valley, resulted in a shift in the location of cotton production. During the 1930's and 1940's the San Joaquin Valley produced practically the entire California cotton crop. High postwar support prices, and the discovery that formerly unproductive soils on the west side would produce high-yielding cotton under irrigation, led to a tremendous postwar expansion of cotton acreage in the San Joaquin Valley. Fresno and Kern counties account for the majority of San Joaquin Valley acreage (and production) with significant quantities also in Kings and Tulare counties. Effective measures of insect control in the Imperial Valley were not available

until after World War II. The sharp increase in southern California acreage (mainly in Imperial and Riverside counties) in 1951–1953 reflects the adoption of control practices by growers as they established acreage "history" in anticipation of possible allotments and increased uncertainties of yields and prices for important competing southern California crops. Acreage allotments after 1953 resulted in acreage cuts in the San Joaquin Valley and southern California.

Trends in yields and production

Yields increased steadily from the late 1920's through the 1930's reaching an early peak in 1940 under exceptionally favorable weather. During World War II, yields were depressed by labor shortages and unfavorable weather. Yields later increased again, but with major annual fluctuations. High yields in 1950 resulted from plantings on better soils and from more timely cultural practices under restrictions of cotton allotments. Depressed yields in 1951–1953 resulted from expansion to lower quality lands, less intensive cultural practices, and rather unfavorable weather. In 1954, cotton allotments once again forced cotton to the most productive soils and encouraged better care on a smaller acreage. Since 1957, state-wide cotton yields have generally been in excess of 1,000 pounds per acre. Higher yields are attributed to increased use of fertilizer, irrigation, more effective disease and insect control, and other improved practices. Yields in southern California range about 25 per cent higher than San Joaquin Valley yields because of the longer growing season. Fluctuations in yields since 1957 are due to adverse weather—for example, a cool growing season in 1966 and a late spring in 1967 (which delayed planting) reduced yield. In addition, pink bollworm infestation in Imperial and Riverside counties affected yields in the same period. Because yields have generally increased, changes in total production have been closely correlated with changes in acreage.





RICE

General description of the industry

The three main rice-growing regions of the U.S. are the prairie region of southwestern Louisiana and southeastern Texas, the prairie region of eastern Arkansas, and the Central Valley of California. California produces about one-fifth of the U.S. supply of rice, and most of the acreage is confined to the lower Sacramento Valley where soil and climate are well adapted to rice culture. Clay soils there require relatively less water for continuous flooding and dry out fairly well after draining at crop maturity, thereby facilitating harvest with heavy equipment. Relatively level land allows large checks and efficient use of machinery in this highly machanized industry. Ample low-cost water, good drainage systems, and hot summers also favor rice production there.

Commercial rice production began in California in 1912 and increased rapidly during World War I. In the inter-war period, California rice acreage was maintained at about 100,000 to 150,000 acres. Acreage controls were imposed in the 1930's and were continued until World War II. The nation's entire rice industry expanded during and after World War II

as production was encouraged to provide wartime exports to allies and postwar relief shipments to distressed nations. By the early 1950's, however, rice production in foreign countries had largely recovered and prices in the world market dropped. Consequently, acreage allotments again were imposed in the U.S. beginning in 1955. The peak acreages of 1953 and 1954 were partly stimulated by government programs to provide rice for South Korea and partly by growers' attempts to obtain acreage history as allotments threatened. Government programs to supply rice to friendly Asian allies permitted the expansion of acreage in California from 226,000 acres in 1957 to 432,000 acres in 1968, although acreage was and is federally controlled.

California rice production historically has been based exclusively upon the short- and medium-grain varieties of the *japonica* type. Production was chiefly comprised of the short-grain (pearl) varieties Caloro and Colusa through the mid-1950's. Short-grain rice was better accepted in foreign markets and shipments amounting to 80 per cent or more of the California crop were exported to the Far East, Puerto Rico, and Hawaii. In 1955, short-grain rice comprised 96 per cent of production. Medium-grain rice (Calrose) production has subsequently increased due to developing export demands and increased domestic consumption of rice breakfast cereals and convenience rice products. In addition to better market acceptance in the domestic market, Calrose has a demonstrated yield advantage over the short-grain varieties; further, it better withstands cooler weather during the growing season than do the short-grain types.

In 1968, California's acreage was 48 per cent short-grain and 52 per cent medium-grain rice. California now produces about 30 per cent of total U.S. production of medium-grain rice and essentially all of short-grain rice. In contrast, nearly one-half of total U.S. production is of long-grain varieties of the *indica* type favored in domestic and export markets. Long-grain variety breeding programs are under way in California, but it is not yet clear that long-grain rice varieties will be included in ultimate California production. With the current market outlook for short- and medium-grain rice, production may continue to be oriented for specialty markets rather than for direct competition with domestic production from other areas. This decision depends importantly on governmental commitments, as a high proportion of the California crop is not consumed domestically. Nearly 20 per cent is shipped to Hawaii, Puerto Rico, and Guam, and 50 per cent to export markets, primarily in the Far East. Principal recipients in recent years have been South Vietnam, Korea, Okinawa, and Japan, although these markets have been affected by increasing rice production in southeast Asia, first in Japan and more recently in the Philippines, where quantities for export have occurred. However, long-term world rice supplies are likely to remain short as demand continues to expand, and the United States is therefore likely to continue to hold its position as one of the world's leading rice exporters.

Changes in acreage and location of production

Total rice acreage has been under continual control by acreage allotments since 1955, and subsequent acreage levels reflect *pro rata* California shares of increases and decreases in the national rice program. Average increases of 10 per cent in 1962 and 1966, and a 20 per cent increase in 1968, are clearly identified as discrete changes in the state rice acreage. A 10 per cent decrease announced for 1969 arrests the continual expansion of rice acreage noted from 1957 onward.

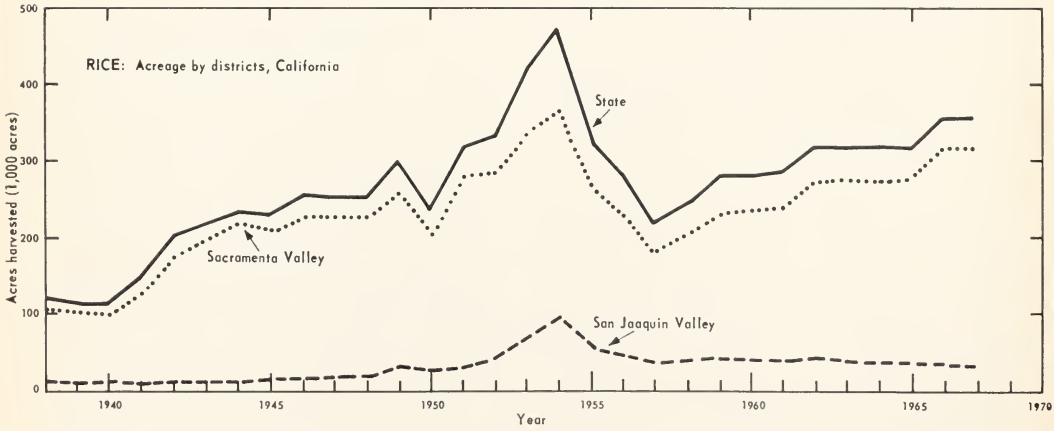
Nearly 90 per cent of the state's rice acreage is concentrated in the Sacramento Valley—Colusa County alone has one-fourth of California's total acreage and together with Sutter, Butte, and Glenn counties holds three-fourths of the state's acreage; Yolo, Yuba, and Sacramento counties are less important. The Firebaugh, Dos Palos, and Los Banos areas, together with acreage in Kern and San Joaquin counties, identify significant production areas in the San Joaquin Valley. Most of the large war and postwar increases in California rice acreage, however, have been in the well-adapted Sacramento Valley

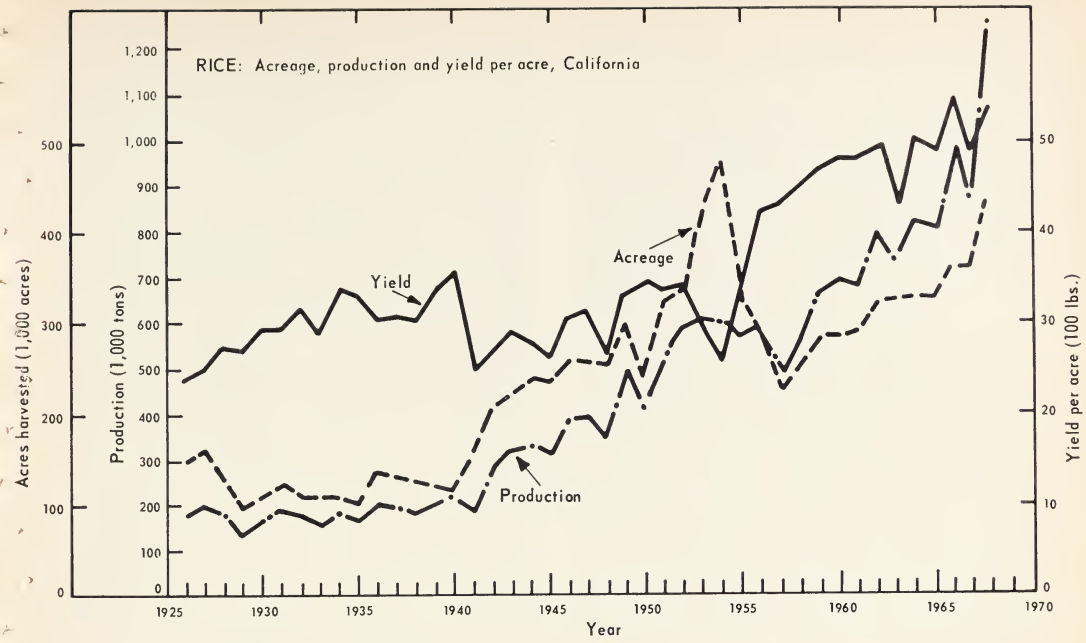
area. Relatively attractive prices and the threat of acreage allotments brought on large-scale land reclamation in the Sacramento Valley in 1954. In the San Joaquin Valley, rice was grown on problem soils for reclamation purposes. Large quantities of water were applied to these soils to leach out salts. San Joaquin Valley acreage decreased as a result of restrictions on the use of phenoxy-type herbicides for weed control, and allotments were moved to the Sacramento Valley by growers. It is unlikely that San Joaquin Valley acreage will increase in the future because of the incompatibility of broad leaf aquatic weed control measures with other crops, and because of higher water costs. In addition to comparatively low-cost water and available land for expansion of rice production in the Sacramento Valley, there also exists the necessary storage and drying facilities which are an important adjunct to rice production.

Trends in yields and production

Rice yields in California have trended upward except for substantial changes in the level of yields resulting from sharp acreage changes in 1941 and from 1953 to 1956. Because of wartime demands, the acreage increases of the early 1940's resulted in the expansion of rice production to poorer soils and the inclusion of some inexperienced growers of the crop. By 1948–1952, yields were at prewar levels on about three times the prewar acreage. Yields dropped sharply again in 1953–1954 as acreage was expanded. Rice yields then rose dramatically with the removal of marginal lands from production in 1955. Yield increases are due to higher levels of fertilizer application, better weed control with new chemicals, and better water management (including low-water control practices). As a consequence rice yields have risen from 2,550 pounds per acre in 1954 to more than 2 tons per acre since 1956, and to almost 2½ tons throughout most of the 1960's. Climate has also geen generally favorable in the recent past, and yields have not been affected by either harsh growing seasons or early fall rains except for the 1963 crop. Yield variability is highly associated with planting time as influenced by spring weather; temperatures during pollination are particularly critical. One other factor which manifests itself in the appearance of higher yields is that harvest machinery is considerably improved. Harvest is now accomplished in a shorter period and crops can be harvested even if lodging is present.

Total rice production has followed the general increase in acreage since 1940. Yield increases in 1955 and 1956 nearly offset the sharp drop in acreage, with the result that production was maintained almost at the peak 1953–1954 levels. Following the sharp yield increases of the mid-1950's (and the associated decline in acreage), total production in California again follows the upward drift of acreage.





SAFFLOWER

General description of the industry

Safflower was first introduced as a crop in California in 1950, and acreage has expanded from minor levels then to an average of about 300,000 acres in the mid-1960's. Commercial production was first introduced in the Great Plains states in the 1940's, but never exceeded about 150,000 acres at its peak in the 1950's. Although industry data are difficult to obtain, California appears to dominate safflower production. In 1965, for example, acreage in California was 89 per cent of total U. S. acreage. Most production is grown under contract to oilseed producers.

Safflower is both a source of safflower oil and protein meal. Until recently, safflower oil was valued principally for its use as a drying oil for paints, varnishes, and related products. Commercial sale of safflower oil for edible purposes began in 1957, and it is now used both as a salad and cooking oil and in the manufacture of margarine. Medical research shows that vegetable oils high in linoleic acid tend to reduce the cholesterol content of the blood serum and thus reduce the incidence of atherosclerosis; because of this, the safflower oil industry has greatly expanded. To an important extent the price of safflower oil is determined by soybean oil, which dominates the vegetable oil market; to date, the market for safflower oil has been strong but the expansion of U. S. soybean acreage and other oilseed crops such as sunflower has resulted in strong competition to California's safflower industry. This is especially true of the export market to Japan. The market for protein meal for the livestock feeding industry is also important and a sizable

outmigration of beef feeding from California could affect the market for protein meals. A third factor contributing to the rapid expansion and acceptance of the crop in California is the fact that safflower production requires no additional equipment beyond that commonly found on farms growing rice or other small grains.

New commercial varieties differing in oil characteristics from previous safflower types are a recent important development in the safflower industry. Research has identified a gene which changes the proportions of oleic and linoleic acids in the oil. The new type (UC-1 and successors) is high in oleic acid—this makes safflower oil chemically like olive oil and thus more suitable for deep frying. Some commercial production of the new type of safflower has begun, and expectations are that the acreage of the new type alone may exceed present acreages. One may regard the high oleic-type oil as a new crop to be introduced in California, as it will be in demand in markets not competing with high linoleic-fatty acid oils.

Compared to other crops, safflower is in its early stage of development commercially. There is tremendous variability within the species and, hence, opportunity for genetic research to improve oil content and quality, protein content, yield, cold tolerance, and resistance to disease. For example, the average oil content was about 35 per cent when safflower was first introduced in California. Commercial varieties are now in excess of 40 per cent and experimental varieties exceed 50 per cent. Thus, there is a logical basis for the belief that safflower will continue as an important commercial crop in California.

Changes in acreage and location of production

Safflower was first introduced in the Imperial Valley and in the San Joaquin Valley where it was mostly grown on land diverted from cotton. The introduction of the crop into these irrigated areas was rather halting due to the lack of root-rot resistant varieties required for irrigation, and because of lack of resistance to verticillium wilt common in cotton-producing areas. Because of these problems, dry-farmed grain soon regained its popularity in the cotton rotations. The center of production quickly shifted to the Sacramento Valley where it was profitably grown on lands with high water tables (particularly in the Sutter Basin), in other areas adjacent to the Sacramento River, and in the Delta. It is especially successful in the rice-growing areas of the Sacramento Valley where it competes well with alternative crops (mainly barley and wheat), fits well in the rotation, and utilizes the same equipment as rice production. The reimposition of acreage allotments for rice in 1955 made the introduction of safflower production both a timely and profitable enterprise on rice farms, and production was concentrated in the Sacramento Valley through 1960. Some lower-yielding production is also found on dry-land farms after fallow.

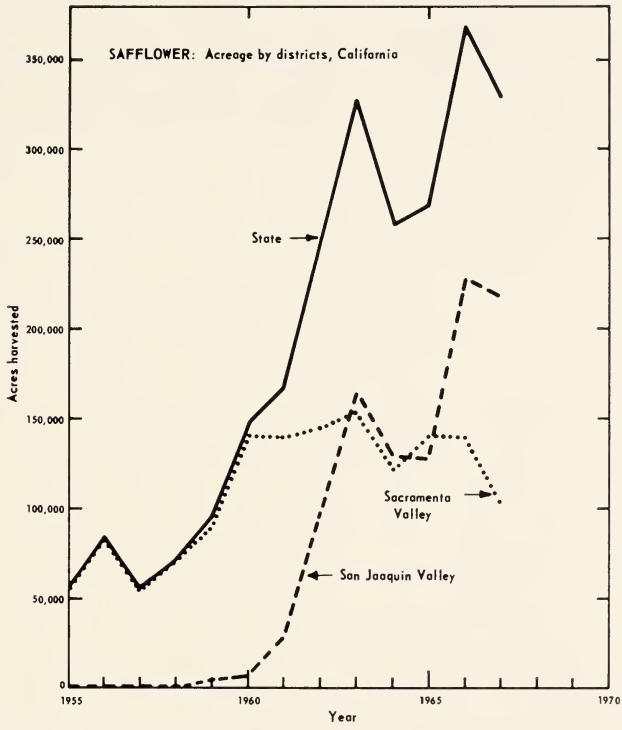
The expansion of market demands in the early 1960's, together with high price incentives and the need for alternative crops on cotton land, led to the re-entry and rapid expansion of safflower production in the San Joaquin Valley from 1961 through 1963. Increased acreages (and production) were aided by the large oilseed crushing capacity which already existed in the San Joaquin Valley. It was proved that with proper management high yields could be attained under irrigation. Production is located on the west side of the Valley, and in the Tulare Lake and Buena Vista Lake areas.

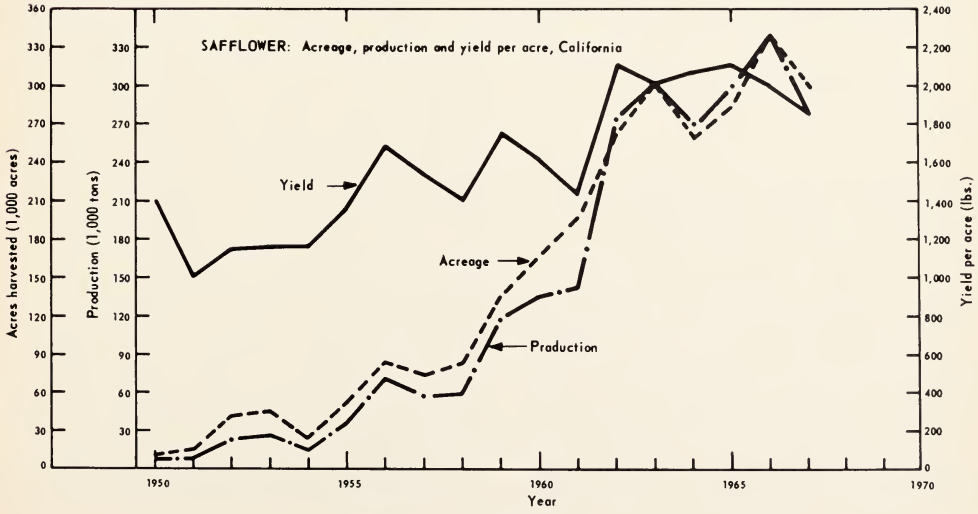
The increase in acreage in the San Joaquin Valley since 1967 has included some of the high-oleic-type safflower, while the decline in the Sacramento Valley in 1967 is due to increase in rice allotments that year. During the mid-1960's, minor acreages of safflower are reported in the Imperial Valley, and it is possible that some acreage expansion may occur there.

Trends in yields and production

The general increase in yields is due to gravitation of production to areas of better adaptation and better soils—but it also reflects the increased experience of farmers in growing safflower. These factors are re-

inforced by heightened research activity by public units and private oilseed firms resulting in the identification of superior varieties and better weed control practices. Decreased yield is due to adverse weather conditions, and to the lack of effective pest-control programs. Yields have nearly doubled from 1951 to the present. Under low-yield conditions, the low-income potential of the crop did not attract the managerial interest now prevalent among commercial producers. The higher level of yields achieved since 1962 coincides with the more successful expansion into irrigated lands in the San Joaquin Valley. Production of safflower has been closely correlated with acreage levels, except that yield fluctuations have had a quite noticeable impact on total production in California in certain years.





GRAIN SORGHUMS

General description of the industry

Grain sorghum production in the U. S. is heavily concentrated in the midwest where Texas, Kansas, Nebraska, and Oklahoma produce about 85 per cent of total U. S. production. California is the fifth-ranking state in production of grain sorghums, producing about 4 per cent of U. S. production on less than 2 per cent of the acreage. Grain sorghum was introduced early into California, mainly as a dry-land crop in many areas of the interior valleys. Grain sorghum is now considered a high-producing irrigated summer crop, grown as a single or (more commonly) double crop. Yields in irrigated areas of California are about double those in the major dry-land producing areas, but costs are considerably higher.

Grain sorghum is not generally a substitute for corn, as each requires different soils, planting dates, etc. Sorghum is tolerant to both salts and alkali, and thus may be produced on poorer soils. Generally, grain sorghums are produced as a double crop following barley or other early summer harvested crops, e.g., early potatoes in Kern County. The development of an adapted variety, Ryer 15, in the early 1950's increased the double-crop potential of sorghum grains, and had a considerable impact on increasing the production possibility in the state. Subsequent development of hybrid grain sorghums in the late 1950's greatly added to increases in production.

Changes in acreage and location of production

Grain sorghum acreage in California remained at about 80,000 acres in the late 1920's, rose through the 1930's, and reached a peak of 204,000 acres in 1941. Acreage declined through the 1940's, but from 1953 to 1958 it increased by about threefold above any previous acreage level. Acreage allotments for cotton in 1954 brought major shifts to grain sorghum as well as to other crops. In addition, the availability of new hybrid varieties in 1955–1956 significantly increased yield and income potential of grain sorghums, and sorghum acreage increased in the face of favorable prices for feed grains. Prior to the introduction of hybrids, the year-to-year variability in grain sorghum acreage was extreme. Hybrids not only have the advantage of increased yields but are lodging resistant and earlier and more uniform in maturity—characteristics which reduce the need for grain drying and its cost. Late spring rains often delay the planting of other crops, and grain sorghum is planted as a substitute.

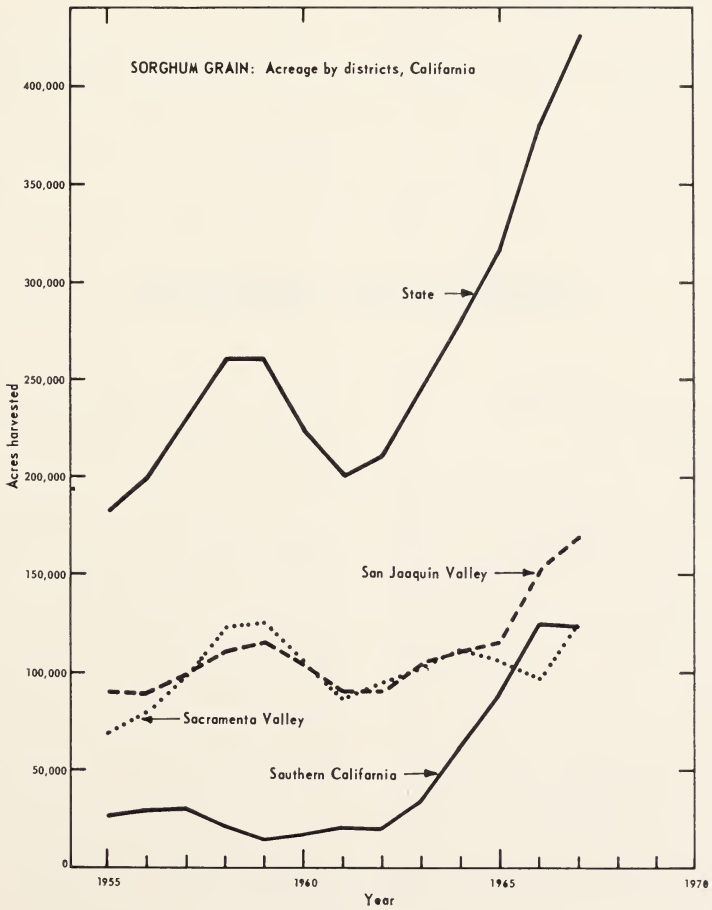
The decline in acreage from 1959 to 1961 was due largely to a poor price situation, whereas the sizable acreage increase since 1961 is due both to more favorable prices and the introduction of additional commercial hybrid varieties with shorter seasonal maturities. As a consequence of the expansion, grain sorghum acreage in 1967 was 424,000 acres. Given favorable prices and the availability of new herbicides, the early maturing, high-yielding hybrid varieties are expected to continue the strong position of grain sorghum as a profitable double-crop alternative for California farmers.

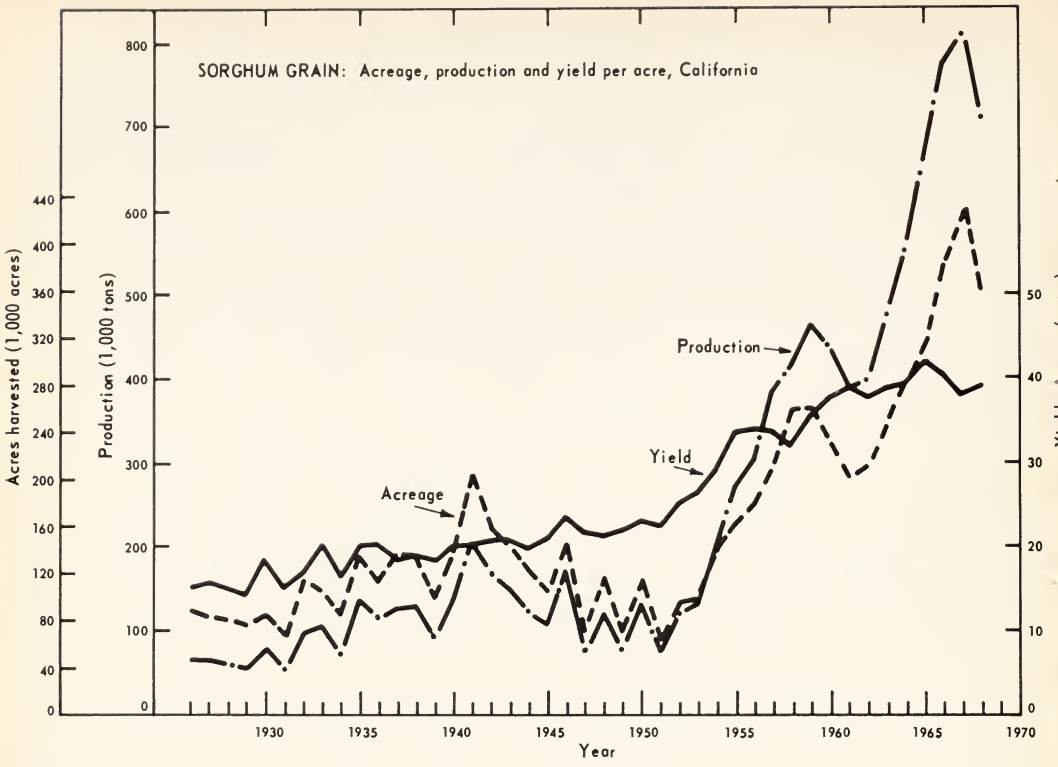
Grain sorghum is grown widely in the Central Valley and in the Imperial Valley, with the latter by far the largest production area. Until recently Imperial Valley production was as a double crop following flax and barley. Flax production has diminished and now grain sorghum is planted after winter vegetables as a single crop with earlier planting dates. In 1962–1966 acreage increased fivefold to 125,000 acres. The San Joaquin Valley has important acreage in the Delta region and on land diverted from cotton production on the west side as well as on lands in the mid-portion of the Valley. San Joaquin, Kern, and Tulare counties are the major producing counties, and Fresno and Kings counties have also had acreages in excess of 10,000 acres in recent years. It is possible that acreage will increase significantly in the next few years on the west side of

the San Joaquin Valley, particularly in Kern County, if the tolerant characteristic of the grain sorghum is used as the basis for the developmental cropping of new irrigable lands served by the California Water Plan. The Sacramento Valley has considerable acreage, with Sutter and Yolo counties the most important areas of production, although Butte, Glenn, Sacramento, and Solano counties have had acreages in excess of 10,000 acres in recent years. Double-crop production has been important in the rice production areas because the timing of operations for sorghum and rice fit well together with early maturing varieties.

Trends in yields and production

Grain sorghum yields have generally increased since the late 1920's. Development in the late 1930's of the disease-resistant Double Dwarf 38 variety apparently helped reduce annual yield fluctuations. The general rise since is primarily the result of new varieties and improved production practices, including greater nitrogen fertilization in recent years. In the 1950's, yields increased sharply as new growers gained experience with the higher-yielding hybrid varieties and better production practices, including more optimal water and fertilization programs, and as more acreage was planted on productive cotton land. Varietal and cultural improvements continued the yield increase through the 1960's. Despite the increase in yields, total production has closely followed year-to-year acreage fluctuations in California. Future production changes in California will also depend primarily on changes in acreage.





SUGAR BEETS

General description of the industry

Production and marketing of sugar in the U. S. is regulated by the Sugar Act of 1948 (as amended) which has among its objectives the protection of the domestic sugar industry's welfare. Marketing quotas are established by the Secretary of Agriculture and sugar beets grown for sugar can only be grown under contract with processors. Over the years, the U. S. government has taken positive steps—in the form of import quotas or subsidies to domestic producers—to foster development of the domestic sugar industry. In the immediate postwar period, mainland production supplied about one-fourth of our sugar needs. Hawaii and Puerto Rico supplied roughly another fourth, while Cuba and the Philippines supplied the remaining half. Following the embargo on sugar imports from Cuba (July, 1960), sources of domestic sugar shifted. Mainland production now supplies about 40 per cent, Hawaii and Puerto Rico another 20 per cent, and the Philippines about 10 per cent. The remainder is imported largely from other western hemisphere sources, with significant quantities from the Dominican Republic, Mexico, Brazil, and Peru. About three-fourths of the U. S. mainland sugar production comes from sugar beets; the rest is from sugar cane. Beet sugar is produced in some 16 states; mainland cane-sugar production is concentrated in Louisiana and Florida.

Early growth in the beet sugar industry was in the northern midwest and Great Plains, where freight rates from distant cane sugar sources were high. Since 1930, howeger, location of acreage and production has changed significantly, with increases in the west and decreases in the central and eastern regions of the U. S. Because yields are higher in the west, the shift in production has been greater than acreage shifts. High yields, along with larger farms and increased mechanization, have permitted relatively efficient production and processing in the western region. Expansion of sugar beet acreage in California accompanied the general shift in production to the west coast. California is now the major sugar beet state, producing about 25 per cent of total U. S. tonnage—California's production has ranged from 4 to 7.5 million tons during the 1960's.

Changes in acreage and location of production

A principal factor limiting California sugar beet acreage in the 1920's was the virus disease, curly top, transmitted by the beet leafhopper. Development of resistant varieties and control by spray programs raised yields and undoubtedly encouraged acreage expansion in the 1930's. A sharp dip in acreage in 1943–1945 was caused by wartime shortages of labor. After the war, acreage expanded sharply, reaching a peak in 1950—mechanization of harvest contributed to this expansion. The 1950 peak in sugar beet acreage may also have been due to the imposition of cotton allotments, but not entirely, as acreage also rose in the noncotton-producing central coast region. In 1951 cotton allotments were removed, and sugar beet acreage dropped in cotton-producing areas. Acreage in 1955 was limited through control of contracts by processors, who carried over substantial inventories from the 1954 crop and were marketing under federal quotas. Acreage allotments were in effect from 1955 to 1960.

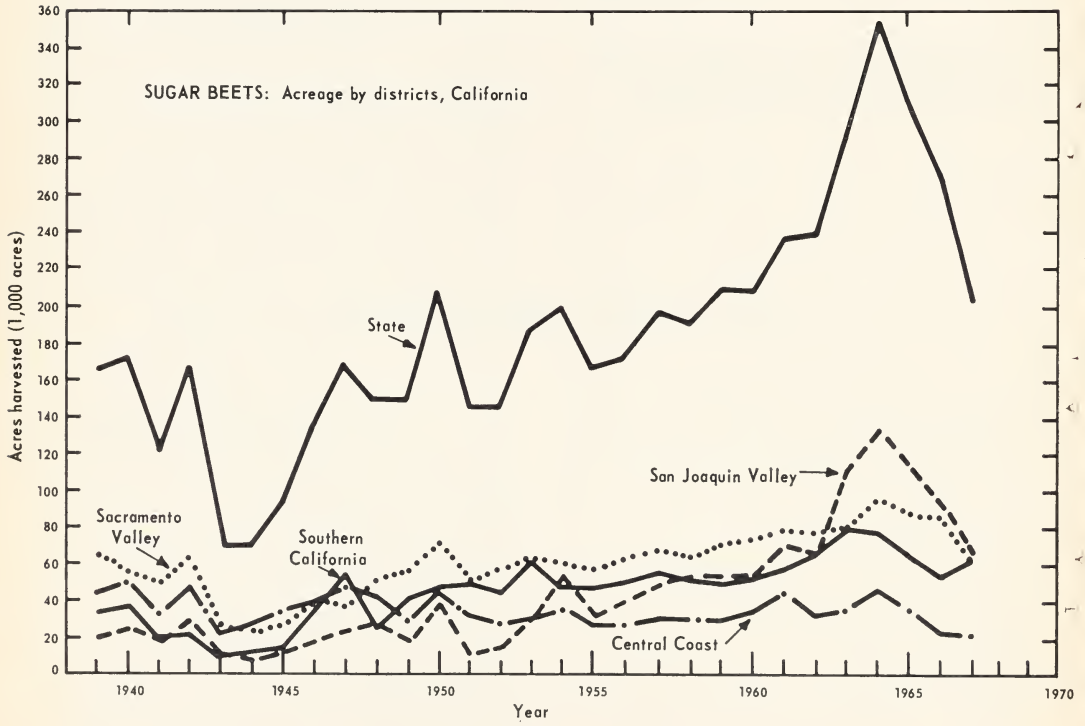
Allotments were removed for the 1961 to 1964 crops, and sugar beet acreage in California expanded sharply from about 200,000 to 350,000 acres. The expansion was due to short sugar supplies and extremely favorable prices during the early 1960's. It is notable that the substantial expansion in California sugar beet acreage in the post-world War II period occurred with the addition of only two processing plants. The increase in production was handled chiefly by lengthening the processing season of existing plants. Beet harvest was extended by establishing the practice of overwintering crops for harvest in the spring, and production was developed in areas with nonpeak harvest seasons. Increased production was also made feasible by innovations, such as development of monogerm seed, precision planters, and mechanical thinners, which eliminated much of the hand labor previously required. Allotments were once again imposed in the 1965 and 1966 crops (some of the acreage increase in 1964 may have been in anticipation of allotments) and removed in 1967. The sharp decline in acreage was also due to adverse changes in price and to other consequences of expanded acreages (inexperienced growers and overwintering problems). Reversal of the acreage trend in 1968 signaled the reemergence of extremely favorable sugar prices. Thus, the experience of the recent past clearly demonstrates the responsiveness of California's sugar beet industry to price and governmental programs.

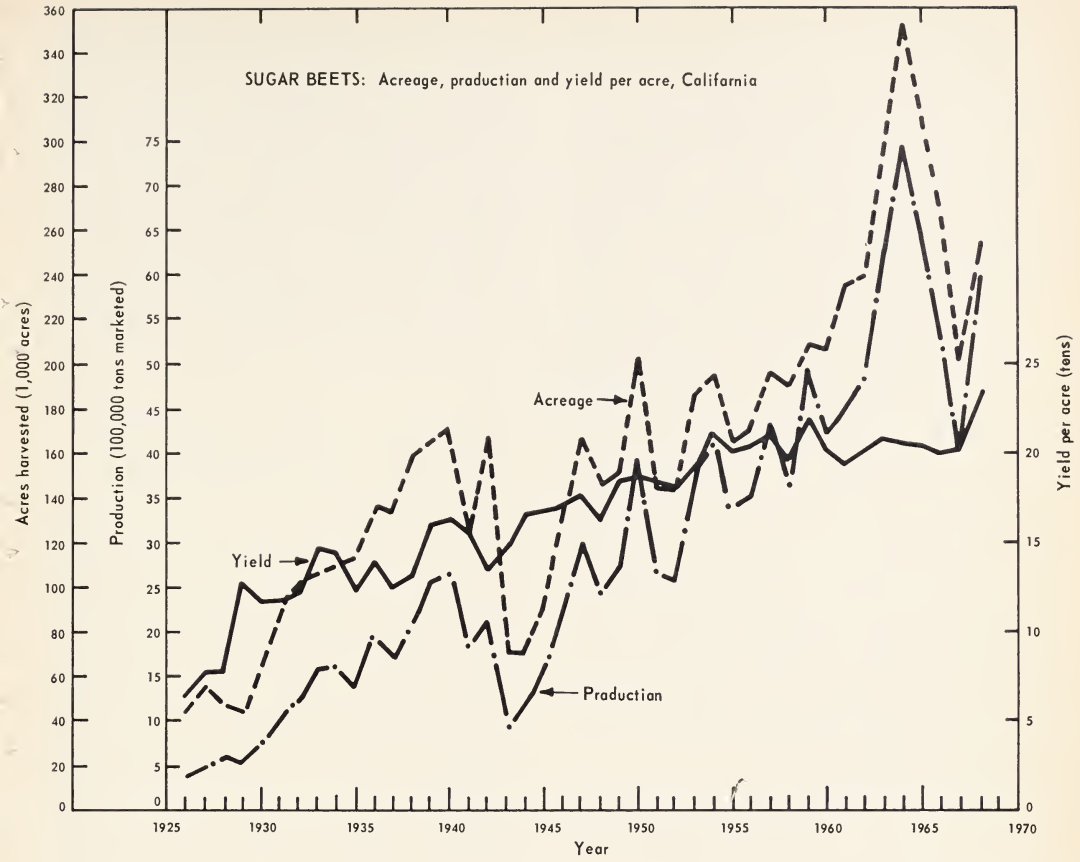
Sugar beets are grown in many interior and coastal counties in California. Imperial County has the greatest acreage in the state. The sharp increase in acreage in 1947 coincided with the opening there of one of California's two postwar processing plants. The Sacramento Valley was generally the most important production area (with significant acreages in Yolo, Solano, Sacramento, and Colusa counties) prior to the opening of the second plant in Mendota in 1963. San Joaquin Valley acreages increased sharply in 1963 and 1964 as a result and it now ranks first in the state. Principal production areas are in San Joaquin County, Fresno, Kern, and Merced counties. The establishment of processing facilities and new areas of production have effectively leveled the location of production within the state. In 1958–1962, the Sacramento and San Joaquin valleys and southern California accounted for 33, 27,

and 25 per cent, respectively, but by 1967 each accounted for nearly 30 per cent. The Central Coast is the remaining production area, with acreage concentrated in Monterey County.

Trends in yields and production

Yields rose sharply in the early 1930's as curly top-resistant varieties and insect control sprays were developed and adopted. A more gradual increase in yields from the mid-1930's to the mid-1950's is attributed to increased fertilization rates (particularly nitrogen) and generally improved cultural practices. Since the mid-1950's, yields have shown no increase due to expansion of acreage to new lands and growers, and to the incidence of sugar beet yellow virus, a problem compounded by the establishment of overwintering beets as an industry practice during this period. Yields rose in 1968 due to an extremely favorable year which permitted early plantings because of a relatively dry spring, few overwintered beets, and low aphid activity. Development of yellow virus-resistant varieties (permitting earlier planting dates) and better aphid control could substantially increase the yield potential of sugar beets in California. Because of the relatively uniform moving yield average since the 1930's, total production has varied in direct response to changes in sugar beet acreage levels.





WHEAT

General description of the industry

California is not a major wheat-producing state—although wheat is a fairly important crop in some areas, total state acreage and production are an insignificant (less than 1 per cent) portion of the U. S. total. In contrast, California was the second largest wheat-producing state in 1890, averaging 40 million bushels annually. The recent state average is around 8 million bushels. The major decline occurred between about 1900 and 1913, when much of the wheat plantings were replaced by barley. California barley then brought high premiums in England because of its exceptional malting qualities. Wheat acreage in California has varied considerably since Warld War I, but without regaining its former importance. Competition from barley in dry-land areas, and from irrigated crops in other areas, has restricted acreage in more recent years. Wheat acreage allotments in 1954–1956 forced wheat acreage in California to the lowest average of three

consecutive years since acreage was first recorded in 1866, and there has been a strong decrease in state acreage from the early 1950's through 1966.

In the main, California has grown soft-white wheat varieties used primarily as livestock and poultry feed. This wheat is not comparable to the hard red spring wheat used in general by the milling industry, although some use is made of it by blending. The decline of wheat acreage in the 1950's and early 1960's resulted from governmental programs which controlled wheat production nationwide and resulted in a price structure for wheat which could not compete for feed usage with barley and other feed grains. During that period wheat predominantly went to the milling industry or into government storage, and it is estimated that only about 10 per cent was used for feed. The recent change in the governmental program (Food and Agriculture Act of 1965), with its change in pricing policy, has redirected wheat into feed use, primarily in poultry and dairy rations. Roughly half of California's wheat production now finds its end use in the feeding industry.

The recent increase in acreage (and production) is due to the introduction of Mexican wheat varieties developed by the Mexican Ministry of Agriculture in cooperation with the Rockefeller Foundation-financed International Maize and Wheat Improvement Center. Though viewed in the beginning as a feed grain competitor, there is some indication from the University of California cereal variety-improvement program that certain new varieties may be suitable for milling. The Mexican wheats are short, semi-dwarf types, resistant to stripe rust disease and to lodging, and capable of higher yields than are the soft white varieties. Introduced into California in the early 1960's, they were first adopted in the Sacramento Valley (in the Yolo, Sutter Basin, and Delta areas) and by 1968 had supplanted California varieties almost entirely in the Sacramento Valley. The higher yielding capacity of the Mexican wheats is due, in part, to their greater resistance to lodging, which permits increased fertilization and irrigation, the result of which is that wheat can compete among cereals as it can be adapted to irrigation or grown on irrigable lands as a rotation crop. Up to now, the bulk of wheat acreage has been concentrated on dryland with associated lower yields. The continued improvement and adaptability of the Mexican wheats could lead to a much expanded acreage in California (perhaps at the expense of barley) depending on the quantity the feeding industry can assimilate and the foreseen development of varieties suitable for milling use and the identification of production areas which can produce milling quality.

Changes in acreage and location of production

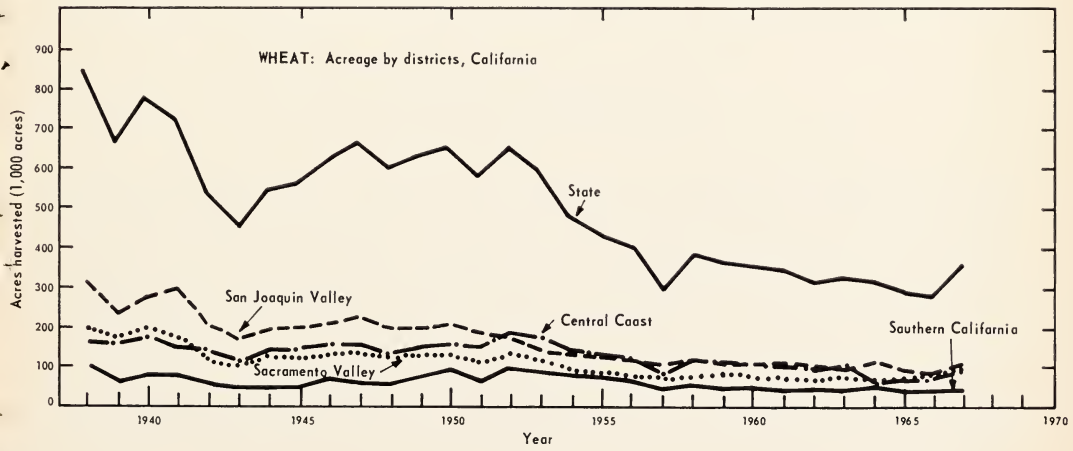
Some wheat is grown in almost every county of California. As late as the 1920's the major proportion of the state wheat acreage was in the Sacramento Valley and northern San Joaquin Valley, but later the San Joaquin Valley became the major wheat-producing area. Wheat in the Central Valley was confined primarily to the dry land-farmed foothill areas. In the San Joaquin Valley and Sacramento Valley acreages have declined since 1938, although Sacramento Valley acreage has increased markedly in recent years due to the earlier introduction of Mexican wheats in that area. In most areas, barley proved to be a higher yielding and more profitable crop. In the irrigated areas of the Central Valley wheat was replaced by beans, grain sorghums, alfalfa seed, and other higher income crops. Production is largely on irrigable lands in Sacramento, Sutter, Solano, and Yolo counties in the Sacramento Valley and in San Joaquin County, whereas wheat is generally irrigated in other San Joaquin Valley counties. Dry-land wheat is grown on the west side of the Sacramento Valley and on the east side of Tulare and Kern counties, although citrus production has displaced considerable traditional dry-land acreage in the latter area in recent years.

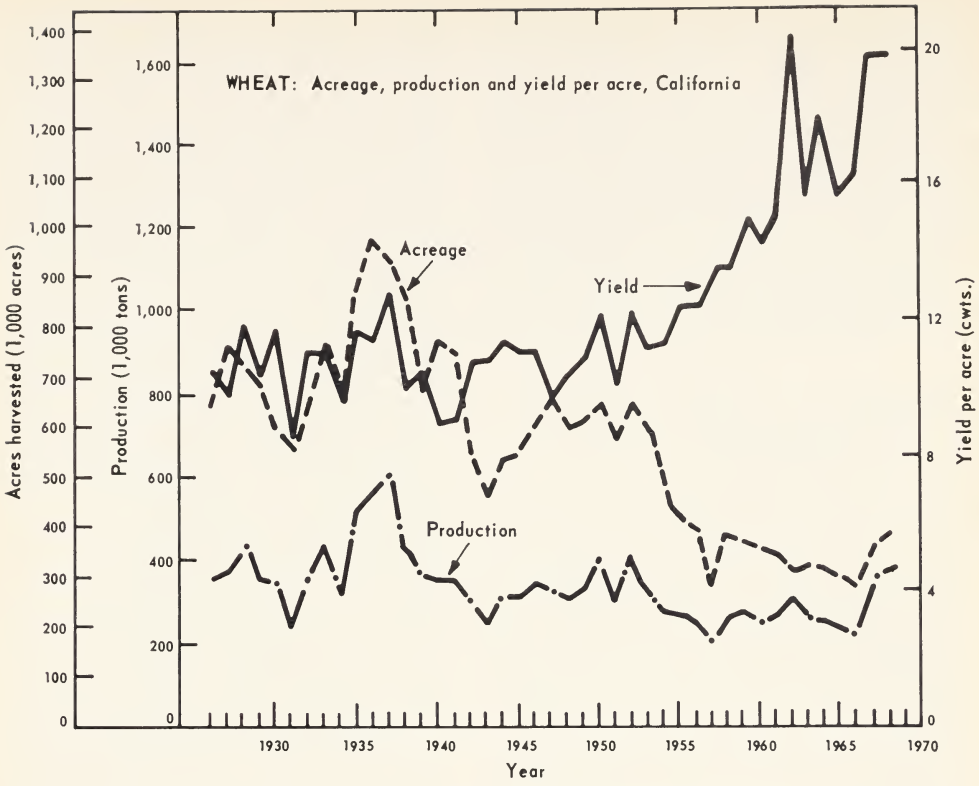
Wheat acreages in the Central Coast area (mainly the Carriso Plains of San Luis Obispo County, where higher protein milling quality wheat can be produced) and in southern California (mainly the higher altitude areas of Los Angeles and River-

side counties) have held up well in the last 15 years. San Luis Obispo County alone accounts for nearly one-fifth of the state's total acreage, despite the fact that the yield is less than one-half the statewide average. The primary reason for the relatively constant wheat acreage in these two areas has been a lack of profitable alternative uses for the land. Minor wheat acreage is also reported in the northern mountain region (chiefly Siskiyou, Modoc, and Lassen counties) but it represents less than 10 per cent of total state acreage.

Trends in yields and production

Wheat yields in California exhibited no trend through the mid-1950's. Production was concentrated in dry-land areas and much of the year-to-year variability was due to changes in annual rainfall, although diseases such as yellow dwarf were sometimes important factors affecting yields. The strong increase since 1955 is thought to be due to increased fertilization, which gave better yields than those possible under the former wheat-fallow regime, and to a higher proportion of the crop being grown on irrigable or irrigated lands. Decreased yields in 1960 were due to an outbreak of stripe rust disease in the Sacramento Valley which dropped yields and quality of soft white wheat varieties. The incidence was also severe in 1961 and in 1963 when it spread over a wider area into the San Joaquin Valley and along the coastal areas into southern California. The increased yield noted in 1962 is unexplainable, although acreage was low and therefore wheat may have been grown on better land; there were also timely rains in May, which may have aided the development of that year's crop on dry lands. The high-yield capacity of Mexican wheats (which are stripe rust resistant) is evident in recent years. The new varieties may reduce yield fluctuations, and may continue to increase statewide level of yields as they are more widely adopted. In general, total production followed acreage changes in the pre-World War II period, whereas yield considerations strongly affected production from the 1940's through 1966, when California's production decreased only slightly despite a reduction from about 700,000 to 300,000 acres. Since 1966, increase in acreage has been important in the increased production noted in the state.





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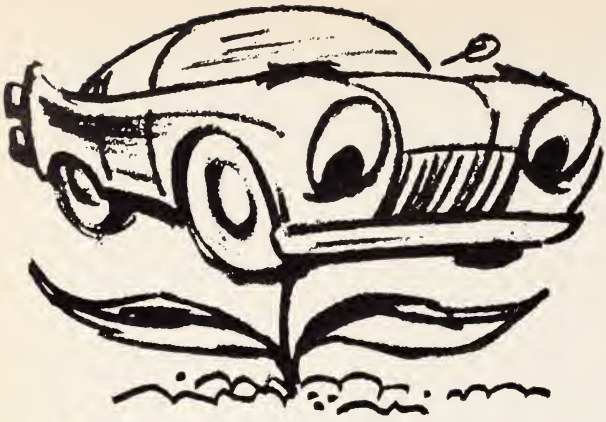

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. . . . . 900,000 bushels of corn
736,000 bushels of flaxseed
74,000 bales of cotton

or, *in terms of approximate acreage:*

. . . . . 15,000 acres of corn
80,000 acres of flax
78,000 acres of cotton

During the same period this company used products derived from 364,000 sheep and 36,000 cattle—plus many other items such as hog bristles and beeswax. In all, produce equivalent to the output of 1,000 good-sized farms is needed yearly. No wonder a top executive in the automotive industry has said: "Our plants, here and throughout the world, would have to close their doors in a few days if their flow of agricultural materials were to stop."

Supplying America's countless industries—and feeding the nation bountifully—makes agriculture America's biggest and perhaps most important business. That is one reason why anything which affects agriculture affects everybody.